# Topics - MINDS MAPS included (Daily current affairs 18th APRIL 2025

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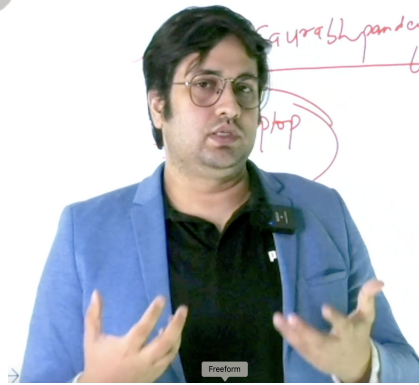

By saurabh Pandey

THE HINDU

# ‘Environment Ministry must roll back order on desulphurising coal plants’

**Jacob Koshy**
NEW DELHI

The Union Environment Ministry should roll back its 2015 policy mandating all of India’s 537 coal-fired plants to install a class of equipment called Flue Gas Desulphurisation (FGD) in order to reduce sulphur dioxide (SO2) emissions. Instead, it should only apply to those plants using imported coal or high (>0.5%) sulphur coal, a study commissioned by the Office of the Principal Scientific Adviser, and executed by the National Institute of Advanced Studies, Bengaluru, has found.

Although coal-fired plants were to have installed FGD by 2018, only 8% of the plants have set up the equipment after the Ministry extended deadlines. As of now, compliance has been pushed to 2027, 2028, and 2029, respectively, depending on the category of the thermal power plant.

**Checking SO2 emissions:** The study was commissioned by the Office of the Principal Scientific Adviser. NAGARA GOPAL

Currently, 230 thermal power plants are in various stages of installing FGD, and 260 have not yet placed an order. It is estimated, according to the Central Electricity Authority, that FGD costs ₹1.2 crore per megawatt (MW) to install. India has an installed coal capacity of 218,000 MW, which is expected to rise to 283,000 gigawatt (GW) by 2032.

The rationale underlying the NIAS analysis is that 92% of the coal used in Indian plants has low sulphur content (0.3%-0.5%). Norms mandated by the Central Pollution Control Board requiring that the stack heights (exhaust columns) in the thermal power plants be a minimum 220 metres, coupled with “Indian climatic conditions”, ensured that SO2 emissions did not threaten local air quality. A study by the Indian Institute of Technology-Delhi in 2024, which the NIAS study references, found that ‘acid rain’, the most visible consequence of high SO2 emissions, “was not a significant issue” in India.

Moreover, installing FGD in all plants would increase power consumption as well as freshwater consumption in the plants, resulting in an additional 69 million tonnes of CO2 (2025-30), while reducing SO2 emissions by 17 million tonnes. The study argues for SO2 emissions, citing an Intergovernmental Panel on Climate Change assessment as having “masked” global warming by 0.5 degrees Celsius from 2010-2019 relative to 1850-1900.

# Understanding Coal Plants and SO2 Emissions

## Introduction to Coal Plants

Coal plants are crucial for electricity production in India, contributing significantly to the country's energy needs.
Despite their importance, these plants pose environmental challenges, particularly affecting air quality.

## What is Sulphur Dioxide (SO2)?

SO2 is a colorless gas with a strong odor, mainly produced by burning fossil fuels like coal.
It poses health risks and environmental issues, such as acid rain.

## The 2015 Policy Mandate

- The Indian government mandated Flue Gas Desulphurisation (FGD) systems in 2015 to reduce SO2 emissions.
- This policy aims to enhance air quality and mitigate environmental impacts

## The Recent Study Findings

- A study by the National Institute of Advanced Studies (NIAS) suggests reevaluating the 2015 policy.
- Not all coal plants may need FGD, especially those using low-sulphur coal.

## Current Status of FGD Implementation

- Only 8% of coal-fired plants have installed FGD systems.
- Compliance deadlines have been extended, indicating challenges in implementation.

## Economic Implications of FGD Installation

- FGD systems involve significant costs, estimated at ₹1.2 crore per megawatt (MW).
- Rising coal capacity could increase financial burdens on the energy sector

## Environmental Considerations

- While reducing SO2 emissions is vital, FGD systems may increase CO2 emissions and freshwater use.
- The study highlights a complex relationship between SO2 emissions and climate change

## Conclusion

- The debate over SO2 emissions from coal plants involves environmental, economic, and health factors.
- A nuanced approach to FGD implementation is necessary, focusing on specific plant needs

# Making primary health care visible, accessible and affordable

Modern public health challenges such as antimicrobial resistance, chronic diseases, and mental health issues highlight the urgent need for a public health system that sees health as more than the absence of disease, factoring in interactions between the environment, socio-economic factors and health-seeking behaviour

Irfan Shakeer
Janane S.

Change is inevitable and is health any exception to that? The nature of public health has changed globally in conjunction with the ever-expanding economy and modern lifestyles. A few modern public health challenges include antimicrobial resistance, chronic non-communicable diseases (NCDs), zoonotic diseases, and mental health illnesses. NCDs continue to account for more than 60% of global deaths and are estimated to increase by 17% in the next decade. These challenges are complex, multifaceted and require a new public health system that comprehensively understands health, one that extends beyond the absence of diseases. This new system needs to see public health as a product of ongoing interactions between the environment, socio-economic determinants, and people's health-seeking behaviour.

The Government of India introduced the 'Ayushman Bharat' scheme in its 2018 Budget as an ambitious project to transform and strengthen India's public health system, including through public funding for the healthcare of disadvantaged groups. This nationally-funded scheme incorporates three major components: Pradhan Mantri - Jan Arogya Yojana (PM-JAY), Ayushman Arogya Mandir (AAM) and Pradhan Mantri Ayushman Bharat Health Infrastructure Mission (PM-ABHIM).

PM-JAY, being the largest publicly funded health insurance, provides financial coverage of ₹5 lakh to BPL cardholders and senior citizens. On the other hand, AAM aims to transform and strengthen primary health care through its Health and Wellness Centres (HWCs) holistically. The delivery of public health services through these centers is anchored around the concept of continuous comprehensive (preventive, promotive, curative, rehabilitative and palliative) care. This brings services related to non-communicable diseases (hypertension, diabetes and high priority cancers), ENT, mental health, oral health, geriatric and palliative care, health promotion and wellness activities closer to the general community. The PM-ABHIM component was launched in 2021 to equip India's comprehensive care system with required health infrastructure to deliver and maintain high quality services within the country.

Public-funded programmes like these are designed to improve survival and well-being, while safeguarding the community from catastrophic healthcare expenditure (CHO). The World Health Organization defines CHO as 'out-of-pocket payments greater than 40% of the capacity to pay for health care.'

As per the latest report from the Union Ministry of Health and Family Welfare, as of November 2024, a total of 1,75,338 AAMs have been established and operationalised with a footfall of 350 crore consultations. If we closely examine the National Health Accounts report 2021-2022, we can see how the Health Ministry has marginally increased healthcare expenditure in recent years. The report also shows a decreasing trend of per capita out-of-pocket health expenditure (OOPHE) in the country. Along with dedicated budgets from respective States, the Central government additionally complements a State's public health infrastructure through schemes like the National Health Mission and Ayushman Bharat.

**For a better tomorrow:** A closer look at the National Health Accounts 2021–2022 reveals that the Health Ministry has only marginally increased healthcare spending in recent years. FILE PHOTO

## Visibility of public health system

In India, however, there exist a few blind spots in the public health system such as user experience, and people's trust and confidence in the system. People's 'trust' in public health or healthcare has always been ambiguous; however, this has been linked with many health outcomes such as health-seeking behaviour, healthcare utilisation and continuity of care and self-satisfaction.

'Trust in healthcare' is defined as 'an optimistic acceptance of a helpless situation where the trustee (patients) believes that the trustor (doctors) will care for their concern or interest' . Many lower- and middle-income nations, including India, still struggle to foster people's trust in their public health systems.

Every country's public health system plays a crucial role in health service delivery and trust brings people closer to the publicly-funded system and safeguards the community against catastrophic health expenditure from the private sector. The private healthcare sector in India still holds a lion's share of health spending.

People often turn to the private sector for consistent care, timely access, and clean infrastructure. India has a respectable public health system that has gradually improved over time, especially at the primary level. Publicly funded sub-centers, primary health centers, and community health centers have been established at the primary level to address the public health needs of the populace, both in urban and rural areas. Each of these institutions provides healthcare services in accordance with their designated catchment areas.

While Ayushman Bharat and the National Health Mission (Urban and Rural) aim to strengthen public health accessibility and infrastructure, the Indian government also introduced the National Quality Assurance Standards (NQAS) to raise public health facilities to global standards. These standards are based on The International Society for Quality in Healthcare (ISQua), and have been developed to improve quality in eight areas of concern: service, patient rights, inputs, support services, clinical care, infection control, quality management and outcomes.

India's SDG (sustainable development goals) 2030 commitments call for a high-quality public health system.

## Way forward

According to The Lancet Global Health Commission on High Quality Health Systems, a high-performing health system is not always indicated by the mere existence of basic infrastructure (such as human resources, medications, running water, power, etc.). The commission further defines a high-quality health system as "one that optimises health care in a given context by consistently delivering care that improves or maintains health outcomes, by being valued and trusted by all people, and by responding to changing population needs."

The Indian Public Health Standards were released in 2007, prescribing only the most basic standards for our publicly-funded healthcare facilities, but it's time to assign top priority to NQAS, which guarantees healthcare that meets international standards. Even though the system produces measurable data about service management and utilisation, it misses a few parameters that people care about. By capturing user experience and making the findings publicly available, we can potentially increase people's trust and confidence in our public health system.

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## THE GIST

- The Government of India introduced the 'Ayushman Bharat' scheme in its 2018 Budget as an ambitious project to transform and strengthen India's public health system, including through public funding for healthcare of disadvantaged groups
- Publicly-funded programmes like these are designed to improve survival and well-being, while safeguarding the community from catastrophic healthcare expenditure
- In India, however, there exist a few blind spots in the public health system, such as user experience, and people's trust and confidence in the system

# Understanding the Ayushman Bharat Scheme: A Transformative Initiative for India's Pub Health

## Introduction to Ayushman Bharat

Launched in 2018 by the Government of India.
Aims to revolutionize the public health system.
Focuses on providing comprehensive healthcare coverage, especially for disadvantaged groups.

## The Vision Behind the Scheme

Ensures access to quality healthcare without financial strain.
Focuses on public funding to uplift healthcare standards.

## Key Components of Ayushman Bharat

Comprises three major components working together to enhance public health

## Pradhan Mantri - Jan Arogya Yojana (PM-JAY)

Largest publicly funded health insurance scheme.
Provides ₹5 lakh coverage for families below the poverty line and senior citizens.

## Ayushman Arogya Mandir (AAM)

Strengthens primary healthcare through Health and Wellness Centres (HWCs).
Offers a holistic approach to health, tackling non-communicable diseases.

## Pradhan Mantri Ayushman Bharat Health Infrastructure Mission (PM-ABHIM)

Launched in 2021 to bolster healthcare infrastructure.
Ensures high-quality services are accessible to all.

## Impact of Ayushman Bharat on Public Health

Aims to mitigate catastrophic health expenditure.
As of November 2024, established 1,75,338 AAMs with 350 crore consultations.

## Challenges in the Public Health System

Trust and User Experience: Public preference for private healthcare due to perceived quality.
Role of Private Healthcare: Dominates healthcare spending, leading to financial burdens.

## Quality Assurance in Public Health

National Quality Assurance Standards (NQAS): Aligns public health services with global benchmarks.

## The Path Forward for India’s Health System

Aligns with Sustainable Development Goals (SDGs) for 2030.
Prioritizes quality and accessibility to ensure healthcare as a right for all.

## Conclusion

Ayushman Bharat represents a significant leap in India's public health.
Focuses on comprehensive care and financial protection.
Building trust and improving user experience are crucial for transformation

# A closer look at strategic affairs and the AI factor

**Adya Madhavan**

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The concerns about an artificial intelligence (AI) arms race have become increasingly frequent. There is speculation about how long it would take for researchers to develop artificial general intelligence or AGI, that refers to AI that can outperform human cognitive abilities and is hypothetically capable of finding solutions to problems outside of merely what it has been trained to know.

While many people are writing about AI and its new and evolving capabilities, the scholarship about how AI impacts strategic affairs is still severely impoverished. A recent paper by Eric Schmidt, the former CEO of Google, Dan Hendrycks, and Alexandr Wang, the CEO of Scale AI, has been a high-profile contribution to this conversation. Still, some of its analysis seems inadequate.

**Points that can be questioned**

Whether AGI is on the horizon or not is a heated debate in itself, but arguably Schmidt, Hendrycks and Wang are right in that if AGI does become a reality, states need to equip themselves to handle security threats and competition. Moreover, as a RAND commentary on the paper points out, the idea of AI non-proliferation makes an important argument focused on preventing potentially dangerous technologies from falling into the hands of the wrong actors. However, some of the mechanisms they prescribe are worth questioning, and one of the central tenets of their paper – the idea that AI is comparable to nuclear weapons – falls short.

The authors propose the idea of MAIM: Mutual Assured AI Malfunction, which functions similarly to the idea of Mutual Assured Destruction (MAD). MAD is a condition akin to a stalemate that can exist between two nuclear-armed states that posits that a nuclear attack by one state would result in a counterattack of at least the same magnitude, which would lead to their mutual destruction.

Scholarship about how AI impacts strategic affairs is still severely impoverished and there is currently no way to determine what superintelligent AI is capable of

The comparison is flawed, since MAD is a condition of mutual annihilation that comes from deploying nuclear weapons, whereas MAIM serves as a strategy of deterrence to prevent the wrong actors from developing superintelligent AI. This comparison can have dangerous implications for the way states draft policies.

The underlying assumption that states can destroy each other's AI projects as they would try to do with physical weapons infrastructure does not account for the fact that AI projects are, by and large, much more diffused than any nuclear projects in terms of infrastructure and have individuals across different places contributing to them.

Attempting to destroy a project of a terrorist group or rogue state could have many unintended consequences, including unnecessary escalation. The paper argues for the preemptive destruction of 'rogue' AI projects, but states do not have perfect surveillance and intelligence capabilities. Additionally, the idea of MAIM for deterrence and the endorsement of sabotage of enemy technologies as a strategic action can be used as a justification for overt military action.

**An unfeasible proposal?**

Another ambitious proposal that the authors make is to control AI chip distribution as one would with nuclear materials such as enriched uranium. What makes this proposal unfeasible is the fundamental difference between the two technologies. AI models do not require ongoing physical resources to function once trained, making supply chain controls harder to enforce.

The paper also makes certain assumptions and leaps in reasoning that serve as worst-case-scenarios, but the reasoning is unclear. First, the authors assume that AI-powered bioweapons and cyberattacks are inevitable unless states intervene early on. However, while AI could theoretically lower the barriers to cyber-threats, whether it warrants being treated like a weapon of mass destruction cannot be said as yet. The assumption that the development of AI will be state-driven also feels like a mere speculation. While there is government oversight to a certain extent, today, the private sector spearheads AI research and then makes technologies available to states and militaries for functions related to national security.

For policymakers grappling with technology as dynamic as AI and the threat of superintelligence looming over them, it is important to leave behind strategy from another time. Making historical comparisons to understand current predicaments is useful, but the analogy is imperfect as a lens through which to look at AI. AI is developed, distributed and deployed vastly differently from nuclear technologies. This comparison can lead to the assumption that deterrent mechanisms would work similarly for superintelligent AI.

**Need for more scholarship**

Better analogies and frameworks are needed to understand the role of AI in strategic affairs. Alternatively, the General Purpose Technology (GPT) framework, which talks about how technologies are diffused across sectors as they develop and are crucial for a state's power, could be a better analogy to look at AI. However, in its current state, AI does not fulfil the 'general'-ness of the GPT diffusion theory since large language models (LLMs) still have severe limitations and are not in a state to be as widely diffused as GPTs.

Increased scholarship on AI in strategic affairs is the only way to equip states to handle superintelligent AI if it becomes a reality in the future. Yet, if and when it happens are the two critical factors that determine what direction policymaking will take since there is currently no way to determine what superintelligent AI would be capable of.

# The AI Arms Race: Understanding the Concerns and Implications

## Introduction to AI and AGI

- Artificial Intelligence (AI) has become a significant topic as technology advances.
- The conversation has shifted towards Artificial General Intelligence (AGI), which refers to AI systems that can outperform human cognitive abilities.
- AGI could potentially solve complex problems, write poetry, and understand human emotions.

## The Current Landscape of AI Research

- Despite excitement, the scholarship on AI's impact on strategic affairs is lacking.
- A paper by Eric Schmidt, Dan Hendrycks, and Alexandr Wang has sparked discussions but leaves some analyses wanting.

## The Role of Key Contributors

- Eric Schmidt, Dan Hendrycks, and Alexandr Wang have contributed significantly to the AI security conversation.
- Their views on AGI and its potential threats raise important questions

## The Debate on AGI's Imminence

The potential reality of AGI is a hot topic.
If AGI becomes a reality, states must prepare for the security threats it poses.

## Security Threats and Competition

- The idea of AI non-proliferation is crucial to prevent dangerous technologies from falling into the wrong hands.

## The Concept of AI Non-Proliferation

- Comparing AI to nuclear weapons is a central tenet but is flawed.
- AI implications are more complex than nuclear weapons, which lead to mutual destruction.

## Mutual Assured AI Malfunction (MAIM)

- MAIM is proposed to function like Mutual Assured Destruction (MAD).
- This concept could lead to dangerous policy-making decisions.

## The Challenges of AI Project Destruction

- AI projects are diffused globally, unlike centralized nuclear weapons.
- Preemptive destruction of rogue AI projects is problematic and risky.

## The Proposal of AI Chip Control

- Controlling AI chip distribution is impractical as AI models don’t require ongoing physical resources once trained.

## The Assumptions in AI Threat Analysis

- The inevitability of AI-powered threats is questioned.
- Policymakers need new frameworks beyond outdated strategies

## The General Purpose Technology (GPT) Framework

- The GPT framework could provide a better analogy for AI's role in strategic affairs.
- Current AI models have significant limitations.

## The Need for Increased Scholarship

- More scholarship is needed to handle the potential reality of superintelligent AI.
- Understanding AI implications is crucial for future policymaking.

## Conclusion

- Concerns about an AI arms race are valid and require serious consideration.
- Rethinking strategies and frameworks is essential as we navigate this complex landscape

# Is the once-extinct dire wolf back?

How did Colossal Biosciences use the genome of gray wolves to 'de-extinct' dire wolves? Why is the practice of de-extinction considered controversial and impractical? How will it affect environmental landscapes? Can ancient species thrive in today's world?

EXPLAINER

Arun Panchapakesan

**The story so far:**

On April 7, a biotechnology company in Texas, U.S., named Colossal Biosciences announced that it had "resurrected" a dire wolf, a large predator that went extinct more than 12,000 years ago. The company's claim that it had facilitated the birth of three dire wolf pups was met with a mix of wonder and delight. Videos of the baby wolves howling went viral, with the company calling their howls the first to be heard on earth in 10 millennia.

**Have dire wolves been de-extincted?**

The total DNA content of an organism, called its genome, is important to understand its identity. The genome of a gray wolf consists of 2.447 billion base pairs. This means there are 2.447 billion positions in the DNA filled by one of the four nucleotides: adenine, thymine, cytosine, and guanine. The order in which these four nucleotides appear determines the genetic identity of an organism. In a preprint paper uploaded on April 11, Colossal Biosciences claimed that the genomes of the gray wolf (*Canis lupus*) and the dire wolf (*Aenocyon dirus*) are 99.94% identical, meaning 2.445 billion of the 2.447 billion base pairs were in the same places in the two genomes.

This small difference is enormous in genetic terms. Humans and chimpanzees share about 98.77% of their DNA, yet no one would mistake one for the other. In the case of wolves, the 0.06% difference still corresponded to 1.47 million base pairs differing between the two species.

These differences are what make the two animals distinct. To create these 'dire wolf' pups, Colossal scientists edited the genome of a gray wolf and implanted embryos with the modified genome into surrogate dog mothers. While Colossal hasn't revealed the exact nature of the changes its scientists made, it says on its website that it made "precise genetic edits at 20 loci across 14 genes" on the genome of a gray wolf to "recreate" the dire wolf. In other words, even if there were a few hundred individual edits across those 20 loci (or positions on the genome), the new animals probably contain 0.02% of the changes that would make them a true dire wolf. And this is an optimistic estimate. Put another way, the new wolf pups are far from being dire wolves.

**From the past:** Colossal's 'dire wolf' pups Romulus and Remus at 15 days old. AFP

**What changes did scientists make?**

The 20 locations where Colossal scientists edited the gray wolf genome all appear to be places that would result in cosmetic changes. For example, one of these regions is on a gene called LCORL, which is responsible for the dire wolves' larger size. Other edits include genes involved in fur colour and density. Thus, Colossal Biosciences can be said to have made gray wolves that look like dire wolves.

While the nature and magnitude of the genetic differences already undermine Colossal's claims, a 2021 study published in *Nature* raised a more fundamental issue. The study suggested that despite genetic similarities, dire wolves may not be true wolves at all, but rather a distinct canid lineage that diverged long before modern wolves evolved. This study prompted scientists to reclassify dire wolves, and their species name changed from *Canis dirus* to *Aenocyon dirus*. This means dire wolves' behaviour, social structure, and ecological roles are likely different from that of modern wolves.

**Why is de-extinction controversial?**

Colossal has said on its website that its mission is to "secure the health and biodiversity of our planet's future." To achieve this, the company aims to revive several extinct species – including the woolly mammoth, the thylacine, and the dodo – and reintroduce them in the wild. Bringing back animals that lived thousands of years ago, like the dire wolf or woolly mammoth, carries significant ecological risks. The environmental conditions, plant communities, prey species, and climate that once supported these animals no longer exist. Modern landscapes are fragmented, and heavily altered by human influence.

Reintroducing extinct species to such drastically changed habitats could do more harm than good, potentially disrupting current ecosystems rather than restoring ancient ones.

**How is conservation changing?**

Misguided claims like these can often have a detrimental effect on lawmakers' priorities. For instance, *The Washington Post* reported Colossal's dire wolf announcement buttressed the Trump administration's plan to weaken federal protections for endangered species.

It quoted Interior Secretary Doug Burgum as saying innovation rather than government regulations will protect species.

Scientists have estimated that 99.9% of all species that ever lived on the earth are now extinct. Dire wolves themselves most likely died out at the end of the last ice age when the numbers of large herbivores, their main prey, started dwindling. The idea of reviving extinct animals is certainly captivating but it seems more prudent to apply this technology to protect and strengthen existing ecosystems rather than reviving extinct ones.

The birth of the genetically modified gray wolf pups may mark the beginning of a new era in conservation, but doubt lingers on what kind of an era it will be.

*Arun Panchapakesan is an assistant professor at the Y.R. Gaitonde Centre for AIDS Research and Education, Chennai.*

## THE GIST

- In a preprint paper uploaded on April 11, Colossal Biosciences claimed that the genomes of the gray wolf (*Canis lupus*) and the dire wolf (*Aenocyon dirus*) are 99.94% identical, meaning 2.445 billion of the 2.447 billion base pairs were in the same places in the two genomes.
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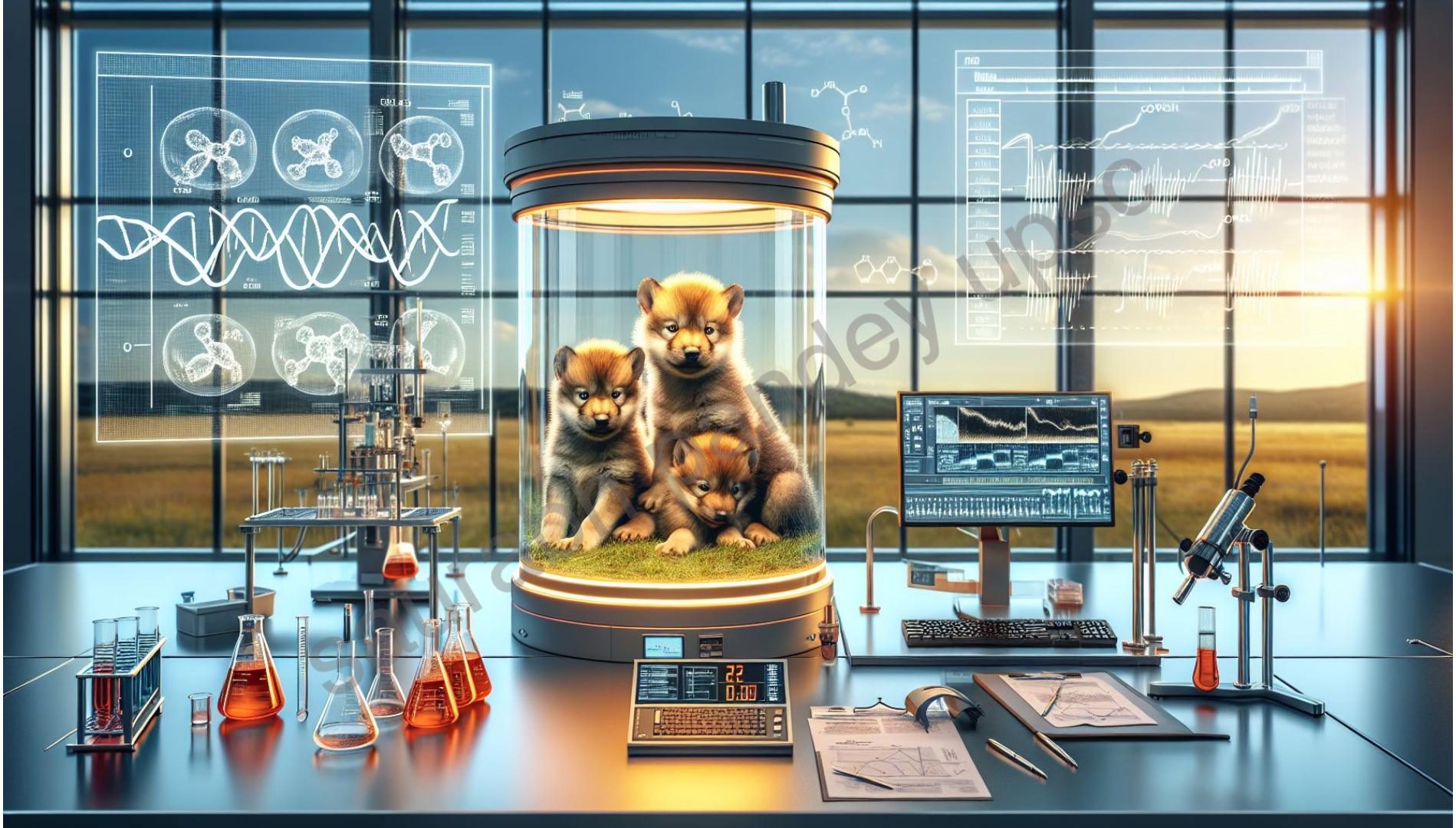


DNA

# The Resurrection of the Dire Wolf: A New Era in Biotechnology?

## Introduction to Colossal Biosciences

- On April 7, 2023, Colossal Biosciences, a Texas-based biotechnology company, announced the "resurrection" of the dire wolf.
- The company claimed to have facilitated the birth of three dire wolf pups, sparking excitement and skepticism.
- Videos of the pups went viral, with their howls being the first in 10,000 years

## What is a Dire Wolf?

- Dire wolves (*Aenocyon dirus*) were large predators from the late Pleistocene epoch.
- They were larger than modern gray wolves and hunted large herbivores.
- Extinction occurred around the end of the last ice age due to prey population decline

## The Claim of De-Extinction

- Colossal Biosciences claims a 99.94% genetic similarity between gray wolves and dire wolves.
- Despite the similarity, even small DNA differences can lead to significant trait variations.

## Understanding Genomes

- Genetic Similarity: Small DNA differences can result in distinct species, as seen in humans and chimpanzees.
- Creating Dire Wolf Pups: Scientists edited gray wolf genomes and used surrogate dog mothers for embryo implantation.

## What Changes Were Made?

Cosmetic Edits: Changes focused on size and fur color, not replicating the full genetic identity of dire wolves

## The Scientific Debate

True Wolves?: A 2021 study suggests dire wolves may not be true wolves but a distinct lineage.

## The Controversy of De-Extinction

- Colossal aims to secure biodiversity by reviving extinct species, but this raises ecological concerns.
- Modern environments have changed, and reintroducing extinct species could disrupt ecosystems.

## The Future of Conservation

- Impact on Ecosystems: De-extinction could divert resources from pressing conservation issues.
- Focus should be on protecting and strengthening existing ecosystems.

## Conclusion

The birth of genetically modified gray wolf pups marks a potential new era in conservation.
The implications for biodiversity and ecosystem health must be carefully considered.

# How can V2G technology help India's power sector?

What are Vehicle-to-Grid technologies? What is the status of this technology in India?

Chandana Sasidharan
Deepak Sriram Krishnan

**The story so far:**

The Kerala State Electricity Board (KSEB) and the Indian Institute of Technology Bombay (IIT Bombay) have initiated a pilot project to explore the implementation of Vehicle-to-Grid (V2G) technology across the State. This collaboration aims to assess the feasibility of integrating Electric Vehicles (EVs) into the State's power grid.

**What is V2G?**

V2G refers to technologies that enable EV batteries to send power back to the grid. When an EV is not in use, it can act as a decentralised battery energy storage device. An idle EV, when connected to a bi-directional charger, can provide support to the distribution grid. By incorporating V2G technologies, EVs offer an opportunity to facilitate the integration of Renewable Energy (RE) and support a demand response market. Technologies for integrating an EV to the grid will need to consider both the charging and discharging of EV batteries. In the first case, there is a transfer of power from the grid to the vehicle (G2V) to charge the vehicle. And in the second case, an EV functions as a distributed energy source where it can provide power based on the requirement of the grid. Overall, the ability of EV batteries to transfer power encompasses many possibilities such as V2G, Vehicle to Home (V2H), Vehicle to Vehicle (V2V) etc. Among these, V2G is the most popular use case.

**Is V2G being applied globally?**

V2G technologies have gained significant traction in mature EV markets such as Europe and the U.S. EVs have emerged as a cost-effective form of distributed energy storage, with owners incentivised to supply power back to the grid. In the U.K. and The Netherlands, EV owners are compensated for supplying excess energy back to the grid during peak hours. In places like California, EV users are actively encouraged to participate in the ancillary services segment of the electricity market, helping improve grid stability and reliability. Under this market mechanism, the compensation is high enough to encourage EV users to offer services during periods of variation in RE generation. EVs are also an important decentralised storage resource, serving as an emergency power resource. With increasing climate-linked disasters, V2G must be encouraged.

**What's the situation in India?**

In India, V2G integration is currently in a nascent stage. The response to growing EV sales largely focuses on planning of the distribution grid with integration of EV charging infrastructure. A few DISCOMs have planned pilot projects for smart charging and V2G integration. The Central Electricity Authority (CEA) has set up a committee to frame guidelines for reverse charging, that is, from batteries to the grid. This committee highlighted smart charging as a key enabler to ensure EV growth with minimal impact on the grid. However, the electricity market structure in India is not the same as in the U.S. or Europe, and the current structure is not suited for decentralised solutions like EVs to send power back to grid. This is due to challenges that arise from the variable nature of RE and mismatches between electricity supply and demand. To mainstream V2G, supportive regulatory changes are needed.

**What is KSEB-IIT Bombay project?**

Kerala is currently experiencing a rapid adoption of EVs, and KSEB has taken several steps to support EV charging. The increased electricity demand for charging has resulted in concerns about evening peak demand. There has also been an exponential growth in rooftop solar adoption. The project plans to assess an EV's ability to support the grid during peak demand when solar energy is not available.

*Chandana Sasidharan is a Program Research Fellow and Deepak Sriram Krishnan is the Deputy Director for WRI India's Energy Program. Views expressed are personal.*

## THE GIST

- V2G refers to technologies that enable EV batteries to send power back to the grid. When an EV is not in use, it can act as a decentralised battery energy storage device.
- In India, V2G integration is currently in a nascent stage. The response to growing EV sales largely focuses on planning of the distribution grid with integration of EV charging infrastructure.
- Kerala is currently experiencing a rapid adoption of EVs, and KSEB has taken several steps to support EV charging.

# V2G technology

- V2G refers to technologies that allow EV batteries to send power back to the grid. Imagine your car sitting idle in your driveway, and instead of just taking up space, it acts as a decentralized battery energy storage device. When connected to a bi-directional charger, your EV can provide support to the distribution grid.

## How V2G Works

- V2G technology operates on two main principles: charging and discharging. When you plug in your EV, power flows from the grid to the vehicle (that's G2V, or Grid-to-Vehicle).
- But here's the cool part: when your EV is not in use, it can send power back to the grid, acting as a distributed energy source.
- This dual functionality opens up a world of possibilities, including Vehicle-to-Home (V2H) and Vehicle-to-Vehicle (V2V) applications, but V2G is the star of the show.

## Benefits of V2G Technology

- The benefits of V2G are immense. Not only does it help in integrating renewable energy sources, but it also supports a demand response market. By utilizing EVs as energy storage, we can balance supply and demand, especially during peak hours. Plus, it encourages the use of renewable energy, making our power grid more sustainable.

## Emergency Power Resource

- With climate-linked disasters on the rise, V2G technology also serves as an important decentralized storage resource, providing emergency power when needed. It’s like having a backup generator that you can drive!

## Challenges in the Indian Market

- However, the electricity market structure in India is quite different from that in the U.S. or Europe. The current setup isn't well-suited for decentralized solutions like EVs sending power back to the grid. Challenges arise from the variable nature of renewable energy and mismatches between electricity supply and demand. To truly mainstream V2G, we need supportive regulatory changes

## The KSEB-IIT Bombay Project

## Objectives of the Project

- Enter the Kerala State Electricity Board (KSEB) and the Indian Institute of Technology Bombay (IIT Bombay). They've teamed up to initiate a pilot project exploring the implementation of V2G technology across Kerala. This collaboration aims to assess the feasibility of integrating EVs into the State's power grid.

# Why the yen is the wrong gambit in any U.S.-Japan trade row

NEWS ANALYSIS

**Reuters**
TOKYO

U.S. President Donald Trump's desire for a stronger yen against the dollar is almost certain to figure into trade negotiations with Japan underway in Washington, but analysts say any effort to shift the currencies is fraught with risks for both sides.

Japan's chief negotiator, Economy Minister Ryosei Akazawa, got talks started on Wednesday by meeting with U.S. Treasury Secretary Scott Bessent and Trade Representative Jamieson, with Mr. Trump also making a surprise appearance.

The White House put the exchange rate unequivocally on the agenda after Mr. Trump last month accused Tokyo of pursuing a policy to devalue the yen, giving the Japanese an unfair trade advantage.

The yen didn't figure into Wednesday's negotiations, Mr. Akazawa said, but currency issues are more naturally a discussion for Finance Minister Katsunobu Kato, who will have his own round of talks with Mr. Bessent when he arrives in Washington next week for International Monetary Fund and World Bank meetings.

Analysts warn that any deal on where the dollar should trade versus the yen is inherently tricky.

An attempt by Tokyo to force the Bank of Japan into speeding up rate hikes could push up the yen, but risks snuffing out Japan's fledgling economic recovery and tramples on the idea of central bank independence.

**Huge stakes:** International investors hold almost $15 trillion in U.S. government debt. AFP

Japanese officials could also sell U.S. dollars for yen, but that would mean pulling out billions of dollars it invested in U.S. debt at a time when markets are particularly fragile.

Citigroup sees Japan as a prime target in the event the Trump administration takes aim at a coordinated devaluation of the dollar to make the United States more competitive globally, a proposal dubbed the "Mar-a-Lago Accord".

"At this point we do not see a 'Mar-a-Lago Accord' as a concrete risk," Citigroup currency strategist Osamu Takashima said.

**A possible target**

However, "countries such as Japan, which have sizeable foreign currency reserves and whose currency is undervalued, would tend to be the target in this case," he said.

The U.S. is Japan's biggest export destination and automobile shipments account for roughly 28% of its exports there. Japan is reeling from Mr. Trump's 25% duty on cars. Since its announcement on March 26, benchmark Nikkei share average has slumped 6%.

Mr. Akazawa offered few details of the talks but told reporters Mr. Trump said getting a deal done with Japan was "top priority".

**Mar-a-Lago deal?**

The yen has already come off lows against the dollar.

In the middle of last year, the dollar was worth almost 162 yen for the first time since 1986, the period after the Plaza Accord when Japan, U.K. Germany and France agreed with U.S. at New York's Plaza Hotel to devalue the dollar.

The Mar-a-Lago Accord is a reference to this and Mr. Trump's Mar-a-Lago Resort in Florida.

This week though, the dollar dipped below 142 yen following a steep slide on fears that Mr. Trump's focus on tariffs could trigger U.S. recession.

And speculative bets on further yen strength have built up to the highest levels since the Commodity Futures Trading Commission (CFTC) started recording the data in 1986.

Mr. Trump and Mr. Bessent would probably be well advised to bear in mind the current environment before making any strong demands for help weakening the dollar.

Unlike in 1985 at the time of the Plaza Accord, international investors hold almost $15 trillion in U.S. government debt, which held a special position as benchmark for risk-free investment returns.

# Mar-a-Lago Accord,

- Because of the boldness of the Liberation Day tariffs, investors now believe that anything could be possible under Trump.
- The so-called Mar-a-Lago Accord, suggested by Stephen Miran, who is now Chairman of Trump's Council of Economic Advisers, stands out as potentially the most disruptive proposition – though this also makes it unlikely to be implemented, at least for now.

# What is the Mar-a-Lago Accord?

**The US gives the rest of the world:**

1. Security
2. Access to US markets/US consumers

**The US gets from the rest of the world:**

1. A weaker dollar
2. A bigger manufacturing sector
3. Existing US Treasury debt swapped to new Treasury century bonds

**Two tools to achieve such an outcome:**

1. Tariffs to grow the US manufacturing sector and to exert pressure on countries to sign the Mar-a-Lago Accord

2. A US sovereign wealth fund that can be used to buy foreign currencies to depreciate the dollar

- The Mar-a-Lago Accord would seek to address what Miran considers the biggest problem for the American economy – the overvaluation of the dollar hurting American manufacturing and thereby widening the US trade deficit.
- His solution would be nothing less than a restructuring of US sovereign debt by swapping short-term US Treasuries held by foreign investors into very long-term, if not perpetual, non-tradable zero-coupon obligations at a much lower implicit yield.

WASHINGTON

# Musk's SpaceX is frontrunner to build Trump's missile shield


REUTERS

Elon Musk's SpaceX, with software maker Palantir and drone builder Anduril, leads the bid for President Donald Trump's "Golden Dome" missile defence shield, proposing to deploy 400-1,000 satellites to detect missiles. Their plan uses a subscription model, drawing significant interest from defence startups. REUTERS

# Golden Dome missile defense shield

- President Donald Trump is building a Golden Dome missile defense shield, which will cost hundreds of billions of dollars to cover the entire globe and monitor enemy threats to the US.
- The state-of-the-art defense structure could be up and running as early as 2026, with Elon Musk's SpaceX company partnering with software maker Palantir and drone builder Anduril to build key parts of the Golden Dome, six sources told Reuters.

# Scientists using James Webb telescope find 'strongest sign of life' on alien planet

**Reuters**
WASHINGTON

In a potential landmark discovery, scientists using the James Webb Space Telescope have obtained what they call the strongest signs yet of possible life beyond our solar system, detecting in an alien planet's atmosphere the chemical fingerprints of gases that on Earth are produced only by biological processes.

The two gases – dimethyl sulfide, or DMS, and dimethyl disulfide, or DMDS – involved in Webb's observations of the planet named K2-18 b are generated on Earth by living organisms, primarily microbial life such as marine phytoplankton – algae.

This suggests the planet may be teeming with microbial life, the researchers said. They stressed, however, that they are not announcing the discovery of actual living organisms but rather a possible biosignature – an indicator of a biological process – and the findings should be viewed cautiously, with more observations needed.

Nonetheless, they voiced excitement. These are the first hints of an alien world that is possibly inhabited, said astrophysicist Nikku Madhusudhan of the University of Cambridge's Institute of Astronomy, lead author of the study published in the *Astrophysical Journal Letters*.

"This is a transformational moment in the search for life beyond the solar system, where we have demonstrated that it is possible to detect biosignatures in potentially habitable planets with current facilities. We have entered the era of observational astrobiology," Mr. Madhusudhan said.


K2-18 b is 8.6 times as massive as Earth. REUTERS

K2-18 b is 8.6 times as massive as Earth and has a diameter about 2.6 times as large as our planet.

**A 'hycean world'**

Earlier observations by Webb, which was launched in 2021 and became operational in 2022, had identified methane and carbon dioxide in K2-18 b's atmosphere, the first time that carbon-based molecules were discovered in the atmosphere of an exoplanet in a star's habitable zone.

"The only scenario that currently explains all the data obtained so far from JWST (James Webb Space Telescope), including the past and present observations, is one where K2-18 b is a hycean world teeming with life," Mr. Madhusudhan said. "However, we need to be open and continue exploring other scenarios."

Mr. Madhusudhan said that with hycean worlds, if they exist, "we are talking about microbial life, possibly like what we see in the Earth's oceans." Asked about possible multicellular organisms or even intelligent life, he said, "We won't be able to answer this question at this stage. The baseline assumption is of simple microbial life."

# The Search for Life Beyond Our Solar System: A Landmark Discovery

## Introduction to the James Webb Space Telescope

- The James Webb Space Telescope (JWST), launched in 2021, is a groundbreaking tool for exploring the universe.
- It has been instrumental in making significant discoveries, including potential signs of life beyond our solar system.

## The Exciting Discovery on K2-18 b

- Researchers using JWST have detected chemical fingerprints of gases in the atmosphere of K2-18 b.
- These gases, dimethyl sulfide (DMS) and dimethyl disulfide (DMDS), are typically produced by biological processes on Earth

## What Are Dimethyl Sulfide and Dimethyl Disulfide?

- DMS is released by marine phytoplankton and plays a role in cloud formation.
- The presence of these gases on K2-18 b suggests potential microbial life, though not definitive proof.

## The Significance of Biosignatures

- Biosignatures are indicators of biological processes, crucial in the search for extraterrestrial life.
- The detection of DMS and DMDS is a promising step, but further observations are necessary.

# Understanding K2-18 b

## Size and Composition of K2-18 b

- K2-18 b is about 8.6 times as massive as Earth and has a diameter approximately 2.6 times larger.
- It resides in the habitable zone of its star, making it a candidate for supporting life.

## The Concept of a Hycean World

- Described as a "hycean world", K2-18 b may have vast oceans beneath thick atmospheres.
- Such conditions could support microbial life similar to Earth's oceans.

## Previous Observations of K2-18 b

### Methane and Carbon Dioxide Findings

- Prior to the latest discovery, JWST identified methane and carbon dioxide in K2-18 b’s atmosphere.
- These findings were the first of carbon-based molecules in an exoplanet's habitable zone

### Conclusion

- The discovery of potential biosignatures on K2-18 b is a thrilling development in our quest to understand life beyond Earth.
- While not definitive, the signs are encouraging, and as exploration continues, more secrets of the cosmos may be unveiled.

# Snowy blanket


Snow-covered chalets after heavy snowfall at Aravis Pass (Col des Aravis), near La Clusaz in east-central France, on Thursday. The Swiss, French, and Italian Alps are experiencing very heavy snowfall, causing major disruptions. AFP

# MAPPING

- The Col des Aravis is a mountain pass in the French Alps connecting the towns of La Clusaz and La Giettaz.

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