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Gamify India's skilling initiatives

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The problem of unemployment has become a contentious issue in economic policy discussions in India in recent times. Economic Survey 2023-24 estimated that India needs to create 78.5 lakh new jobs in the non-farm sector annually until 2030 to meet the demands of the rising workforce. One of the policy prescriptions often suggested to overcome the unemployment challenge is to close the growing gap between the skill sets of job seekers and the skill requirements of the industry.

India's skilling challenge

Over time, India has established a comprehensive institutional and policy framework for training and skilling. However, the success of this is somewhat limited. The Periodic Labour Force Survey 2022-23 identified that only 21% of the Indian youth aged 15-29 years had received vocational/technical training through formal and informal sources. The share of youth who had received formal vocational/technical training was 4.4% in 2022-23. The Chief Economic Advisor, V. Anantha Nageswaran, recently stated that only 51% of India's graduates are employable. These facts raise concerns regarding the reach, quality, and industry relevance of existing skilling programmes. Incidentally, one of the focus areas of the Prime Minister's package for employment and skilling announced in the 2024-25 Budget was improving the outcome and quality of skilling and aligning the training content and design to the skill needs of the industry.

The enormity of India's skilling challenge is further aggravated by the need to equip the workforce with skills and knowledge that meet the requirements of industry 4.0 (I4.0), which entails integrating advanced technologies such as artificial intelligence, robotics, the internet of things, and big data to do smart manufacturing. Over two-thirds of Indian manufacturers are expected to embrace digital transformation by 2025. Government policy support has been given to prepare the industry for I4.0 through the SAMARTH Udyog Bharat 4.0 initiative. But according to estimates, only 1.5% of Indian engineers possess the skills for new-age jobs. Sixty percent of the Indian MSME workforce lacks the new-age digital skills. So, it becomes crucial to skill and upskill our workforce according to I4.0 needs.

Gamified and simulation-based learning and training modules can potentially improve the quality and outcome of workforce training

A new initiative

India could consider incorporating gamified and simulation-based learning and training modules. While gamified learning incorporates game elements into skill training, simulation-based learning uses virtual environments that mimic real-world scenarios, allowing learners to practice and apply skills in a safe and controlled setting. Using game mechanics makes skill training interactive and enjoyable, leading to higher participant engagement and knowledge retention than traditional learning methods. Also, the rewards and recognition through points and badges can motivate learners to complete training tasks and strive for excellence. Gamified systems often provide instant feedback to help trainees understand their progress and areas for improvement. Features such as 'Leaderboards and challenges' can foster a sense of competition, thereby encouraging trainees to perform better. Clear goals and milestones in gamified learning help trainees stay focused.

Simulation-based learning provides hands-on experience in a controlled environment and allows trainees to experiment, make mistakes, and learn from them without bothering about real-world consequences. Simulations also help trainees understand complex systems and develop critical thinking, problem-solving, and practical skills. Also, the immersive nature of the simulations allows learners to retain the knowledge gained for longer. Singapore and Germany have adopted gamified and simulation-based learning into their education, vocational, and skill training systems.

Adopting such a module in government skilling programmes can potentially improve the quality and outcome of workforce training. The module can be customised by identifying areas where skill sets are lacking. Trainees can be presented with challenges during training that will be adjusted based on their progress. The platform can feature training modules that simulate actual professional circumstances, enabling trainees to apply their knowledge practically. Simulations can assess the trainee's decision-making abilities and demonstrate the outcomes resulting from their decisions. At a decentralised level, the module can be extended to education institutes of higher learning by providing the students with a platform to work on real-world projects. Students can be given opportunities to intern on live projects and demonstrate their skills, and industry can use this talent pool while hiring.

The SWAYAM and Skill India Digital Hub (SIDH), the two online platforms for skill education and training initiated by the Indian government, can host the gamified and simulation training module. The SWAYAM platform hosts more than 4,000 courses. Since its inception, over 40 million participants have enrolled in the platform and a lion's share (93.45%) of successful course completions in the platform were under the engineering and physical sciences stream. As of June 2024, 7.63 lakh candidates were enrolled in SIDH's 752 online courses. The platform offers 7.37 lakh minutes of digital content, making it a potentially rich resource for learners. The response to SWAYAM and SIDH demonstrates the huge demand for technical education and training in India and further strengthens the idea of offering gamified and simulation-based skill training on such platforms.

Death by water

Governments need to ensure safety of piped water while widening coverage

As policymakers prioritise universal access to potable water, the death of three persons last week in Chennai due to suspected consumption of contaminated piped water is a reminder that coverage is not the only problem: even urban centres with a long history of piped supply are still not assured of potable water that is free from dangerous contamination. The incident, which involved drinking water supplied through the State agency in suburban Pallavaram, also sent 34 people to hospital with complaints of diarrhoea. The laboratory test reports of local water samples are yet to be made public, and it may be too early to blame the agency. Nonetheless, the remarks of State Minister T.M. Anbarasan, accusing the affected people of not maintaining hygiene in their surroundings, come across as insensitive and irresponsible. Irrespective of the cause, it is concerning that severe contamination of water continues to occur with greater periodicity in cities in India. In the past six months, large-scale outbreaks of health episodes due to consumption of water containing *E.coli* have been reported in cities including Bengaluru, Kochi, Noida and Vizianagaram. This exposes the challenge of catering to the basic needs of people, who are increasingly shifting to cities and living in congested environs, putting the water and drainage infrastructure under strain.

Governments face a challenge in providing safe drinking water in a tropical country such as India. Data from the Jal Shakti Ministry show that arsenic has been detected in groundwater in parts of 230 districts in 25 States and fluoride in 469 districts in 27 States. In 2022, according to the World Health Organization, at least 1.7 billion people, globally, used a drinking water source contaminated with faeces. Worldwide, an estimated one million people die annually from diarrhoea caused by unsafe drinking water, sanitation and hand hygiene. In 2010, the United Nations General Assembly had explicitly recognised the human right to water and sanitation. Towards this end, addressing the issue of chemical pollution of groundwater is also non-negotiable. Tamil Nadu Chief Minister M.K. Stalin is cognisant of this. Ahead of the last Assembly elections, he had unveiled his 10-year vision statement for seven priority areas to facilitate development of Tamil Nadu. This included promises to increase the annual per capita drinking water supply from nine lakh litres to 10 lakh litres; reduce wastage of water from 50% to 15%; and increase distribution of recycled water from 5% to 20%. Now, he needs to walk the talk, especially in terms of supplying safe drinking water.

Ayodhya verdict likely to be at the forefront of the battle over Places of Worship Act in SC

Krishnadas Rajagopal
NEW DELHI

The Supreme Court's *Ram Janmabhoomi* case judgment in 2019, which gave the title of the disputed Babri Masjid site to the Hindu side, finds itself in the vanguard of a legal battle on the validity of the Places of Worship Act.

Observations made in the judgment impresses, in less than 10 pages, the necessity to keep alive a Central law so "intrinsically related to the obligations of a secular state".

A Special Bench headed by Chief Justice of India Sanjiv Khanna is scheduled to hear the challenge to the Places of Worship Act, 1991, on December 12 even as multiple legal actions instituted by Hindu plaintiffs in local courts across States such as Uttar Pradesh and Rajasthan question the character of several mosques and even the Ajmer dargah.

The challenge to the validity of the 1991 Act began trickling in even before a year passed after the Ayodhya judgment in November 2019. The petitions have highlighted the wrongs done during the distant Mughal period. The petitioners find the 1991 Act, which mandates the preservation of character of religious places of worship across faiths as they existed on August 15, 1947, a hindrance to reclaim lost temples.

Legal wrangle: The Gyanvapi mosque in Varanasi where a survey was conducted by the ASI based on the orders of a court. AFP

However, the petitioners would have to address the Constitution Bench's mandate in the Ayodhya judgment that the state and citizens have a positive obligation under Article 51A to preserve religious harmony and protect the equality of all faiths – an essential constitutional value and a norm which has the status of being a basic feature of the Constitution.

"The law [Places of Worship Act] speaks to our history and to the future of the nation. Cognizant as we are of our history and of the need for the nation to confront it, Independence was a watershed moment to heal the wounds of the past. Historical wrongs cannot be remedied by the people taking the law in their own hands. In preserving the character of places of public worship, Parliament has mandated in no uncertain terms that history and its wrongs shall not be used as instruments to oppress the present and the future," the five-judge Bench in the 2019 Ayodhya judgment said.

The Bench said the protection of the 1991 Act was unavailable only in cases in which the conversion of a religious character of a place of worship had taken place after August 15, 1947 and a legal action had been pending at the commencement of the statute.

However, this exception would not be applicable to ancient and historical monuments or archaeological sites or remains governed by law; to a suit or legal proceeding which has been finally decided settled or disposed of; to any dispute settled by the parties before the commencement of the 1991 Act; to a conversion of a place of worship effected before the commencement of the Act by acquiescence; and to any conversion of a place of worship before the commencement of the Act in respect of which the cause of action would be barred by limitation.

In October 1994, another five-judge Bench of the top court, this time examining the constitutional validity of the Acquisition of Certain Area at Ayodhya Act of 1993, had held in a majority view that the "status and immunity of a mosque from acquisition in the secular ethos of India under the Constitution is the same and equal to that of the places of worship of the other religions, namely, church, temple, etc".

The minority view on the same Bench, by Justices S.P. Bharucha and A.M. Ahmadi, had highlighted that both the 13-judge Bench in the historical *Kesavananda Bharati* case and the nine-judge Bench of the top court in *S.R. Bommai* case had upheld secularism as a part of the basic features of the Constitution.

"The state was enjoined to accord equal treatment to all religions," they had pointed out.

Should AI be blamed for sporadic layoffs in Big tech?

Thomas Monteiro, lead analyst at Investing.com, says, 'AI hasn't yet grown good enough to replace the bulk of human workers end-product-wise. However, what it did do is change companies' priorities'

Poulomi Chatterjee

During Alphabet Inc.'s September-ending earnings call on October 29, CFO Anat Ashkenazi told investors that the company wants to tamp down costs, noting it would mostly be on how it operates and runs its business. The following day, worried Googlers sought more details at a company's all-hands meeting. CEO Sundar Pichai stuck to a similar refrain, without giving a direct yes or no to questions around layoffs. Mr. Pichai said efficiencies in headcount could also mean reallocation of human resource to streamline teams.

"When you're doing something new and it's going to take 10 people, if you are able to do it with eight people by making smart trade-offs somewhere, that's a good example," he noted. While Ms. Ashkenazi reassured that people are "one of the most important" assets to the company, Mr. Pichai did not wave off the possibility of layoffs. "If we are making company-wide decisions, we'll definitely let you know," he said. Google's head of recruiting, Brian Ong, added that it was a reality that the search giant was tightening hiring, and that workers would find fewer open positions.

Like other tech companies, Alphabet is overhauling its business processes with AI while fending off pressure from investors. Bank of America analysts had warned in June, post Ms. Ashkenazi's appointment as the new CFO, that there was "potential for the company to 'surprise' with further self-help cost cutting actions after limited layoffs in 2024."

Google is a microcosm of the transformation happening in many other tech firms. Employees at Big Tech companies have seen a steady stream of layoffs. Last year alone, based on various reports, nearly a lakh tech workers lost their jobs in just U.S.-based tech companies.

This year, Google laid off more than 200 employees from its core engineering teams in May. During a previous internal meeting, Mr. Pichai said the constant layoffs were necessary to "improve velocity" of the company. The Silicon Valley giant slashed hundreds of staff from their cloud unit, sales and engineering teams again in June. In October, Meta started making similar small cuts across various segments including WhatsApp, Instagram and their Reality Labs division. This followed layoffs in done earlier in June.

Meanwhile, in Amazon, CEO Andy Jassy said in September that he would restructure the e-commerce giant in a way that the ratio of individual contributors to managers increased by 15% by March 2025. A Morgan Stanley report estimated that this could mean eliminating around 13,834 managerial positions resulting in cost savings of between $2.1 billion to $3.6 billion. The company also announced a strict five days a week return-to-work policy starting from 2025. Disgruntled employees were convinced that this was a backdoor layoff tactic. Although Mr. Jassy denied this later, at an all-hands meeting days later, Matt Garman, CEO of Amazon Web Services said that displeased employees who were averse to the policy were free to seek employment elsewhere. Amazon also keeps closing down units in smatterings. In late October, it shut down its speedy brick-and-mortar delivery service called Amazon Today. A couple of weeks ago, it phased out its free-to-watch streaming service, Freevee.

GETTY IMAGES

Microsoft laid off around 2,000 employees in its gaming unit, months after acquiring Activision Blizzard. Two other rounds of cuts were done consecutively in June and July in Azure's product and programme management segments. LinkedIn, owned by Microsoft laid off 200 employees unceremoniously just last week.

Is AI just a ruse?

How much of the blame can truthfully be placed on AI deployment? "This is a correction for a decade-long trend of over hiring in the sector. As easy capital went to the side-lines in 2022, it has become more difficult to start new tech companies and that takes away tech jobs," explained Aswath Damodaran, Professor of Finance at the Stern School of Business at New York University.

"This is not really about AI, though you may be tempted to make it so. Most of the tech layoffs are happening at places that hired well before AI was even a glimmer in the market's mind. This is a story of accountability eventually catching up at young tech companies that sold themselves on potential but have never have been able to monetise it," he noted.

But even if it is a natural comedown, investors are now forced to reckon with the sky-high AI expenditures coupled with a long road before seeing any profitable returns.

Big Tech's large capex

According to *Visible Alpha*, Microsoft will spend over $80 billion in the current fiscal year, which is a jump of more than $30 billion from the previous year. The Redmond, Washington-headquartered company also predicted slower growth for its cloud segment in the quarter. Mr. Zuckerberg also pegged "significant acceleration" in costs to the pace with which Meta was building data centres and AI infrastructure. The company raised the low end of its capital expenditures guidance for 2024 to $38 billion from $37 billion after its earnings report, with the higher limit still at $40 billion. Alphabet reported $13 billion in capital expenditures in the third quarter, and CFO Ashkenazi is intent on keeping it the same in the fourth quarter.

Meanwhile, Andy Jassy said he plans to spend $75 billion on capex in 2024 and expects an even bigger number in 2025. Mr. Jassy told investors that GenAI "a really unusually large, maybe once-in-a-lifetime type of opportunity," reassuring shareholders they would feel good " in the long term."

During the early days of AI, many thought that their jobs will be replaced.

Thomas Monteiro, lead analyst at Investing.com, points out that, "Saving a few specific sectors, AI hasn't yet grown good enough to replace the bulk of human workers end-product-wise. However, what it did do is change companies' priorities, meaning that these are rethinking how they allocate their resources, more than often taking the risk of replacing several otherwise essential workers for a highly disputed, expensive AI specialist."

Labour force inflation and lack of clarity on how to monetise AI is also "forcing companies to figure out ways to become more efficient. But if they can't cut from the expenses side because the competition will run them over once they figure out the AI game, what's left? Well, only further reductions," he added.

The market has been ruthless to companies that ignored the clarion call of AI at the opportune moment. Intel, a Silicon Valley icon, announced it would be laying off 15,000 employees earlier in August to accommodate a $10 billion savings plan after it became obvious that the company had gotten left behind in AI. To add insult to injury, the company was replaced on the Dow Jones Industrial Average index in November by Nvidia, a company that Intel tried to buy two decades ago.

Although the rate of tech layoffs have somewhat slowed, they haven't fully stopped as tech companies are shedding employees wherever they see fit. "In a sense, layoffs are unavoidable," Mr. Monteiro said. "Companies will always have a choice, and historically, we've seen companies challenging the status quo to reach good results by thinking outside the box. However, we currently live in a world where shareholder value is just as important as consumer value, and no one is willing to take the risk."

The place of charity in an unequal society

Billionaire Warren Buffet has given away an amount of almost 52 billion dollars to various charities. While such a move is no doubt commendable, one must also question the processes generating the concentration of such wealth in the first place, regardless of whether it is to be used for philanthropy or not

ECONOMIC NOTES

Rahul Menon

Billionaire Warren Buffet, with a net worth of almost $121 billion by some estimates, has maintained his pledge of giving away his wealth. In a recent message to shareholders of Berkshire Hathaway, he has mentioned a transfer of his wealth to foundations overseen by his children, a total amount of around 870 million dollars. In all, it is estimated that he has given away an amount of $52 billion.

Mr. Buffet's recent message has captured the attention of mainstream discourse as it has outlined his social philosophy with regard to wealth and its place in society. Mr. Buffet believes that wealth should be used to equalise opportunities, that the luck that favoured certain individuals and helped them get rich should be extended after one's death in order to help those less fortunate. While it is not wrong to amass and accumulate wealth during one's lifetime, allowing it to build across generations is a problem for society. While it is no doubt commendable that Mr. Buffet wishes to give away his fortune, one must also question the processes generating the concentration of such wealth in the first place, regardless of whether it is to be used for philanthropy or not. Inequality is not a question of luck, but of specific policy institutions determined by society. In a world of spiralling inequality, both private philanthropy and the problems it tries to solve are two sides of the same coin, emerging from the very same set of social processes.

On luck and equal opportunity

Mr. Buffet's ideas with regard to wealth and welfare can be seen in the context of a philosophical idea called "luck egalitarianism", which states that no-one should have to suffer the consequences of inequality owing to bad luck or adverse situations. As Mr. Buffet repeatedly

ISTOCKPHOTO

stresses in his letter, he credits much of his personal fortune to fortuitous circumstances, such as being born as a white male in the U.S. Opportunities were open to him that would not be open to women or African-Americans, and the growth of the U.S. over the years caused his wealth to grow significantly through the power of compound interest.

Some might accuse Mr. Buffet of false modesty, claiming that his fortune has been generated through his own diligent efforts and his understanding of markets. But there is truth in what he says. As Branko Milanovic has shown, a significant factor driving global inequality is the differences in income between countries. Where one is born determines how wealthy one might be relative to the global population. In that regard, Mr. Buffet does display a strong egalitarian zeal. If fortune played a huge role in the differences between Mr. Buffet and others, there is no moral justification for him to pass on his wealth to his descendants. The only moral response is to ensure his wealth can be used to boost the opportunities of those less fortunate. What matters is the equalising of opportunities, and allowing individuals a level playing field in the beginning, rather than trying to equalise final outcomes.

What about charity?

However, there are some important questions that need to be addressed. The distribution of private wealth through charity may help to equalise well-being between individuals, but the process by which this wealth was generated and concentrated has led to the differences in opportunities in the first place. In the developed world, wealth distribution was largely equal during the post World War II period. Widespread deregulation and a turn towards neo-liberal economics saw an explosion of wealth inequality from the 1980s onwards, with the 'trickle-down' economics of Ronald Reagan and Margaret Thatcher leading to the concentration of gains for a tiny sliver of individuals and stagnant wages for the majority. In India as well, the liberalisation of the economy may have led to faster growth, but has dramatically increased inequality and skewed the distribution of opportunities.

Differences in opportunities are not merely a question of luck, but of specific policy choices and interventions. Bill Gates' and Jeff Bezos' wealth came from the monopolies they enjoyed in the marketplace; this is less luck than the failure of policy to ensure competitive market practices. Mckenzie Bezos might be doing important work in giving away much of her wealth, but one must ask how it was that Amazon generated so much money for its owners while its workers suffered through stagnant wages and harmful working conditions. Mr. Buffet earned much of his wealth through the compounding of his initial equity holdings, but the widespread financialisation of the U.S. economy – concomitant with the reduction in the power of unions and stagnant wage growth – greatly aided this process.

In the face of rising inequality, societies face a choice: to either do nothing and hope that private charity increases, or devise policy to counter the negative effects of rising wealth concentration. Thomas Piketty advocates for a system of taxation and redistribution backed by the State to ensure equalisation of opportunities, rather than relying on private philanthropy. Interventionist thinkers and those on the left advocate for higher minimum wages and constraints on billionaire compensation. The use of state policy ensures that one does not have to rely on billionaire conscience to ameliorate the very processes that gave rise to their wealth in the first place.

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THE GIST

- Mr. Buffet believes that wealth should be used to equalise opportunities, that the luck that favoured certain individuals and helped them get rich should be extended after one's death in order to help those less fortunate.
- Mr. Buffet's ideas with regard to wealth and welfare can be seen in the context of a philosophical idea called "luck egalitarianism", which states that no-one should have to suffer the consequences of inequality owing to bad luck or adverse situations.
- Differences in opportunities are not merely a question of luck, but of specific policy choices and interventions. Bill Gates' and Jeff Bezos' wealth came from the monopolies they enjoyed in the marketplace; this is less luck than the failure of policy to ensure competitive market practices.

What went wrong at Sathanur dam?

Many days before the historic rainfall brought by Cyclone Fengal, Sathanur was filled to 95% of its capacity

DATA POINT

Sambavi Parthasarathy
Vignesh Radhakrishnan

Data show that Cyclone Fengal brought the highest rainfall recorded in the last 70 years to upstream areas of the Sathanur dam in Tiruvannamalai district of Tamil Nadu. The dam, which was already close to its full capacity days before it received water from the rainfall, flooded villages downstream.

Could the floods have been avoided? Last week, AIADMK general secretary Edappadi K. Palaniswami alleged that the release of water from the dam, without prior notice, had caused the floods. PMK president Anbumani Ramadoss said, "If water had been released gradually, such a big catastrophe wouldn't have happened." The DMK government has denied these claims, stating that proper protocol was followed in managing the dam and issuing flood warnings. An analysis of rainfall figures and of data on the dam's storage and flow explains the event.

Map 1 shows various taluks in the Pennaiyar river basin and the location of the Sathanur dam.

Tables 2A-2C show the top 10 wettest days between January 1954 and December 2024 in three immediately upstream taluks of the dam – Harur, Uthangarai, and Chengam. In Harur, 251mm of rainfall was recorded on December 2, the highest in the last 70 years by a wide margin. In Uthangarai, 185mm of rainfall was recorded on that day, the second highest in the period. In Chengam, 115mm of rainfall was recorded, the seventh highest for that place.

Data also show that the downstream taluks of the Sathanur dam recorded copious amounts of rainfall, which increased flooding in the Thenpennai river. **Tables 2D-2F** show that in downstream areas such as Thandarampattu and Tiruvannamalai, the amount of rainfall recorded on December 1 and December 2 was so high that those days feature in the top 10 list of the wettest days in the last 70 years. In Sankarapuram, the 255mm received on December 2 was the highest in 70 years.

Chart 3 shows the inflows, storage percentage, and outflows of the Sathanur dam between December 5, 2023 and November 28, 2024 (two days before the floods).

In December last year, the dam was filled to 95% of its capacity after heavy rainfall. Later, when inflows stopped due to lack of rain, the dam was opened gradually. The outflow was maintained initially at 530 cusecs and later at 1,430 cusecs for irrigation, drinking water, and electricity generation purposes. The storage went down to 20% by May-June and the outflow was stopped.

In August, rainfall increased the storage to 40%. Heavier rainfall further boosted the storage to over 90% in September and over 95% in October. On many days of September and October this year, water was released in a controlled manner (500-1,200 cusecs) to maintain the storage level at around 95%.

Chart 3 shows the dam's usual cycle: storing water from August to December, releasing it in a controlled fashion from January to April, and repeating the cycle.

Chart 4 presents the same information as Chart 3A, with the addition of data from the seven days between November 29 and December 5, 2024. Due to the historic rains upstream, there was a huge inflow of water into the dam, which was already filled to 95% many days before the event.

Between December 2 and 5, 1.3 lakh cusecs of inflow was recorded in the dam, with a similar amount of outflow. As the dam was already filled to the 95% mark, storing the water and releasing it in short bursts was not an option. Heavy rainfall downstream further worsened the crisis.

Ebbs and flows in a dam

The map was sourced from the National Water Mission website. The daily rainfall data for the various upstream and downstream locations was sourced from the IMD's gridded rainfall database. The storage and flow data of the dam was sourced from the tnagriculture.in website

Map 1: Map shows various taluks in the Pennaiyar River Basin and the location of the Sathanur dam

An analysis of rainfall figures and of data on the dam's storage and flow explains the event

Chart 3: The inflows, storage percentage, and outflows of the Sathanur dam between December 5, 2023 and November 28, 2024 (two days before the floods). In charts, K= 1,000

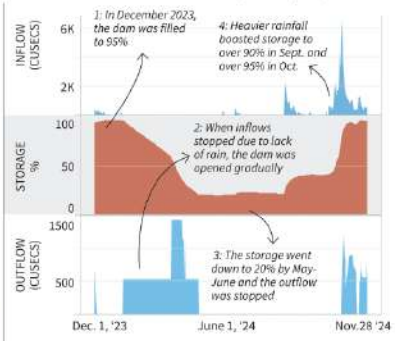


Chart 2: Tables 2A-2C show the top ten wettest days, between January 1954 and December 2024, in three immediately upstream taluks of the dam — Harur, Uthangarai and Chengam.

Tables 2D-2F show the top ten wettest days, between January 1954 and December 2024, in three downstream taluks — Thandarampattu, Tiruvannamalai and Sankarapuram

*Rainfall in mm ^Rank

2A: Harur

Dec. 2, 2024	**251***	**1**
Nov. 29, 1959	147	2
Nov. 10, 2015	147	3
Oct. 8, 1986	147	4
Dec. 22, 1983	117	5
Dec. 5, 1993	115	6
Oct. 29, 1991	115	7
Dec. 2, 2017	112	8
Nov. 16, 1991	108	9
Dec. 16, 1971	107	10

2B: Uthangarai

Dec 18, 1996	316	1
Dec 2, 2024	**185**	**2**
Dec 20, 2007	147	3
Dec 2, 2017	135	4
Nov 10, 2015	127	5
Nov 19, 2021	123	6
Nov 6, 1994	106	7
Dec 8, 1972	101	8
Aug 16, 2011	92	9
Jul 26, 1964	92	10

2C: Chengam

Dec. 20, 2007	191	1
Dec. 2, 2017	167	2
Nov. 4, 1966	144	3
Nov. 19, 2021	134	4
May 17, 1955	120	5
Nov. 10, 1966	117	6
Dec. 2, 2024	**115**	**7**
Dec. 16, 1971	111	8
Nov. 20, 1969	110	9
Nov. 6, 1994	107	10

2D: Thandarampattu

Nov 4, 1966	174	1^
May 17, 1955	159	2
Nov 19, 2021	145	3
Nov 20, 1969	142	4
Dec 2, 2024	**141**	**5**
Oct 29, 1991	135	6
Nov 6, 1994	130	7
Nov 28, 2008	120	8
Dec 2, 2017	118	9
Dec 1, 2024	**115**	**10**

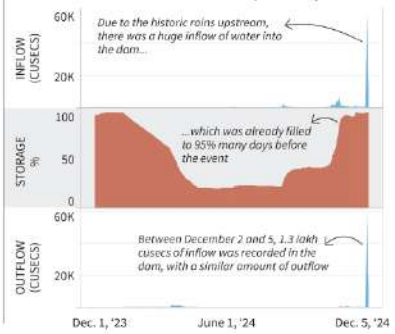
2E: Tiruvanamalai

Dec 20, 2007	191	1
Dec 2, 2017	167	2
Nov 4, 1966	144	3
Dec 2, 2024	**141**	**4**
Nov 19, 2021	134	5
May 17, 1955	120	6
Nov 10, 1966	117	7
Dec 1, 2024	**115**	**8**
Dec 16, 1971	111	9
Nov 20, 1969	110	10

2F: Sankarapuram

Dec 2, 2024	**255**	**1**
Nov 10, 2015	203	2
Dec 20, 2007	183	3
Nov 28, 2008	180	4
Nov 19, 2021	179	5
May 1, 1966	177	6
Nov 4, 1978	170	7
Nov 20, 1969	165	8
Dec 17, 2020	158	9
Nov 26, 2008	157	10

Chart 4: The same information as Chart 3A, with the addition of data between November 29 and December 5, 2024. K= 1,000



The issue of India's economic growth versus emissions

Badri Narayanan Gopalakrishnan

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A look at the claim made in the Economic Survey (2023-24), of India having decoupled its economic growth from greenhouse gas emissions

The Indian economy has consistently showcased its robust growth over the past few decades. But higher economic growth is believed to have come with increasing environmental pressure, notably through higher greenhouse gas (GHG) emissions. However, India's Economic Survey (2023-24) claims that India has decoupled its economic growth from GHG emissions, as between 2005 and 2019, India's GDP grew at a compound annual growth rate (CAGR) of 7%, while emissions rose at a CAGR of just 4%. This raises a crucial question: has India really decoupled its economic growth from GHG emissions? And, what does this mean for sustainable development?

What it means

Decoupling refers to breaking the link between economic growth and environmental degradation. Historically, economic growth is found to be positively related with environmental degradation, as this growth is believed to be a driver of GHG emissions. However, with the growing climate crisis, the imperative to reduce emissions while ensuring continued economic growth has gained global traction.

Decoupling has largely been classified into two types: absolute decoupling and relative decoupling. Absolute decoupling occurs when the economy grows, while emissions decrease. This is the ideal form of decoupling, where countries grow economically without increasing environmental harm. However, relative decoupling happens when both GDP and emissions grow, but the rate of GDP growth surpasses the rate of emissions growth. While this signifies progress, at the same time, it acknowledges that emissions continue to rise.

Decoupling of economic growth and GHG emissions is important. On one hand, it offers a path to sustainable growth and development, a way for nations to grow and improve living standards without exacerbating climate change. On the other, it comes as a response to rising demand for degrowth and sparks the ongoing debate between green growth and degrowth. Proponents of green growth argue that it is possible to maintain or even increase economic growth while reducing environmental harm. In contrast, degrowth advocates suggest that economic growth itself is the primary driver of ecological degradation and should be curbed in favour of reducing resource consumption. But proponents of degrowth overlook the fact that countries, in addition to tackling rising GHG emissions and the climate change, are also required to tackle low standards of living, energy poverty and ensure a decent life, which could be taken care of through economic growth.

The claim

The claim of India's decoupling made in the Economic Survey comes from comparing GDP and emissions growth rates between 2005 and 2019. The Survey does not specify whether this represents absolute or relative decoupling. Using various decoupling indicators discussed in OECD (2002), we examine the status of the economy-wide and sector-wise decoupling status for India. Since the 1990s, with significant trade liberalisation, India has been experiencing steady and stable economic growth. Hence, we are examining how GDP and emission generation are growing in India with respect to the levels of 1990. While there has been no absolute decoupling in India, since 1990, GDP in India has grown at a much higher pace than the GHG emissions in the country, indicating economy-wide relative decoupling. Since, the agriculture and manufacturing sectors are among the major contributors of emission generation in India, it is also important to understand whether these sectors have also achieved decoupling or not, which has been assessed by comparing rate of growth of GVA of the respective sector with the rate of growth of GHGs emitted by the sector. From 1990, India's GDP has grown six-fold, while GHG emissions have only tripled.

Efforts must continue

From the data, it seems that India may have achieved relative decoupling, where emissions are still rising but at a slower pace than the economy. This achievement, while commendable, falls short of the ultimate goal of absolute decoupling, where economic growth can continue even as emissions fall. While most countries fall short of achieving absolute decoupling and still experience rising emissions as GDP increases, many countries have at least managed to achieve a declining rate of growth of emissions. Given that India is a developing country which has not even peaked its emissions yet, emissions are expected to increase with economic growth. Hence, achieving absolute decoupling is not going to happen anytime soon. While India's relative decoupling is a step in the right direction, the path to absolute decoupling is still a long and complex journey. Efforts must still be taken and it will be a significant challenge. This remains a necessary target if India is to meet its long-term climate commitments. Policies and measures that support renewable energy, emission mitigation, and sustainable development will be crucial in ensuring that economic growth and environmental preservation can coexist, ensuring a prosperous and sustainable future for India.

The views expressed are personal

Study brings Indian star tortoise to evidence-based conservation

Researchers have identified two genetically distinct groups of the species. The genetic divergences showed up as differences in physical features that could inform strategies on where and how to release and conserve rescued tortoises, Subhasree Sahoo, a Ph.D. student and first author of the study, says

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The Indian star tortoise (*Geochelone elegans*) is a sight to behold, with its obsidian shell and the striking sun-yellow star patterns adorning it. These tortoises are hardy herbivores and are popular as exotic house pets – but they shouldn't be. It's illegal to own one in India but also unethical since they are vulnerable in the wild.

Endemic to the subcontinent, Indian star tortoises reside in arid pockets of northwest India (bordering Pakistan), South India, and Sri Lanka. However, members of the species have also been found in people's homes as far afield as Canada and the U.S. The increasing demand for them as pets has entangled them in one of the largest global wildlife trafficking networks.

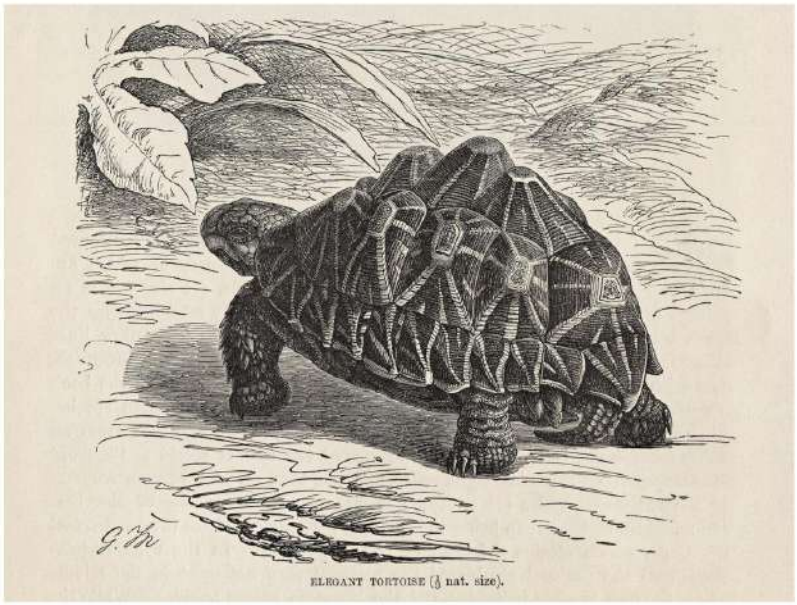
The Indian star tortoise is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and in Schedule I of the Wildlife (Protection) Act 1972, which provides the highest level of protection to animals in Indian law. Despite this, officials have already seized hundreds of tortoises being smuggled through the Chennai and Singapore airports and across the India-Bangladesh border this year.

Wildlife biologist Sneha Dharwadkar, co-founder of an NGO called Freshwater Turtles and Tortoises of India, is worried that unscientific releases of the seized tortoises could worsen their fate. "We can no longer simply take confiscated tortoises and release them in nearby forests," Dharwadkar wrote in an email.

To find an alternative, researchers from the Wildlife Institute of India and Panjab University explored the diversity and natural distribution in India by sequencing the genomes of Indian star tortoise in zoos, wildlife reserves, and protected areas.

The study identified two genetically distinct groups of Indian star tortoises: northwestern and southern.

The genetic divergences showed up as differences in physical features that could inform strategies on where and how to release and conserve rescued tortoises, Subhasree Sahoo, a PhD student at the Wildlife Institute of India, Dehradun, and first author of the study, said.



An engraving of an Indian star tortoise. THE ROYAL NATURAL HISTORY (1896)

Same but different

Millions of years ago, *Geochelone*, the group that includes the Indian star tortoise, spread across the Indian subcontinent after the latter split from the Gondwana supercontinent and collided with Eurasia.

Over time, parts of the subcontinent became arid and encouraged the growth of savannahs and open grasslands in northwestern and peninsular India, which are now the tortoises' natural habitats.

But the creation and expansion of savannahs came at the expense of humid forests: the increasingly seasonal nature of the monsoons restricted them to parts of southwest India and Sri Lanka. This separation of humid and dry areas paralleled the splitting of the tortoises into northern and southern groups about 2 million years ago.

To find genetic evidence of this split, the researchers of the new study collected tortoise tissue samples from 14 locations.

"These tortoises are very rare to encounter, so I chose the rainy season because that's the breeding season. They're the most active. That's also what poachers do," Sahoo said. With the help of frontline forest staff and local communities living near the tortoises' natural range, she was able to collect 38 samples from northwestern India and 44 from southern India.

Researchers prefer tortoises' blood samples for genetic testing but even small mistakes when drawing blood can cause profuse bleeding. This is manageable in controlled environments like zoos or wildlife reserves, and less so in the wild.

"When I was in Kakatiya Zoo in Telangana, a zookeeper told me, 'Madam, why do you want to take blood? You can take the scutes, right? They come off very easily'," Sahoo said. Scutes are keratin layers found on the tortoises' limbs, neck, and shell. "I peeled off some scute from the zoo in Kakatiya and tested [it] in the lab, and it worked just fine."

The increasing demand for them as pets has entangled them in one of the largest global wildlife trafficking networks

Once collected, the researchers extracted DNA from the tissue samples. Then they sequenced the mitochondrial genes cytochrome B and NADH dehydrogenase 4. The gene for cytochrome B is highly conserved and used to identify subspecies-level differentiation and later to detect smaller genetic variations between the samples.

The researchers also screened 10 microsatellite markers: short DNA sequences that repeat in a particular location in the genome. They serve as a genome's fingerprint and are helpful to identify how individuals of the same species are related, how they mate, and recent changes in their population.

The results revealed that even after illegal poaching and unscientific releases, the northwestern group remains largely genetically unchanged whereas the southern group is highly diverse.

"For a long time, on-ground practitioners have suspected the presence of at least two evolutionarily significant units, or ESUs – populations of organisms considered distinct for conservation purposes," Dharwadkar said. "This paper provides a reliable confirmation of that."

Restoring natural order

Sandeep Kumar Gupta, nodal officer at the Wildlife Institute of India, Dehradun, and corresponding author of the study said that since different Indian star tortoises are found in different areas, it's crucial to not mix the populations during release. Doing so might lower their genetic diversity and depress breeding rates.

Sahoo also raised the concern of shell-pyramiding in captive-bred star tortoises. These tortoises develop pyramid-shaped shells instead of the dome-like shells in the wild due to nutritional deficiencies, and can further complicate mating and breeding issues.

Gupta also emphasised greater public awareness of the legality of keeping certain species as pets and the importance of adhering to national laws on this front.

Overall, the team expressed belief in its paper that the findings could benefit both national and international agencies with evidence-based conservation of the Indian star tortoise.

(Sanjukta Mondal is a chemist-turned-science-writer with experience in writing popular science articles and scripts for STEM YouTube channels. sanjuktamondal.sm@gmail.com)

THE GIST

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Foreign direct investment inflows into India cross $1 tn

Foreign direct investment (FDI) inflows into India have crossed the $1 trillion milestone in the April 2000-September 2024 period, firmly establishing the country's reputation as a safe and key investment destination globally. According to data from the Department for Promotion of Industry and Internal Trade (DPIIT), the cumulative amount of FDI, including equity, reinvested earnings and other capital, stood at $1,033.40 billion during the said period. PTI