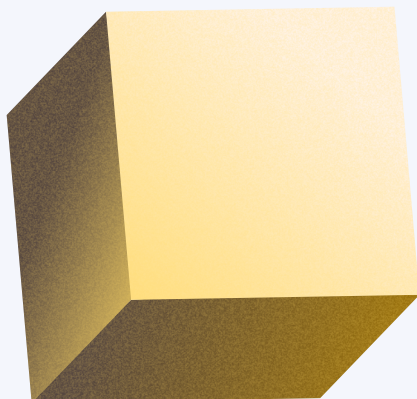


THE HINDU ANALYSIS

4th April 2024
by saurabh pandey



Topics

- **Telescope - around moon , Dark age , Pratyush radio telescope.**
- **TUBB4B**
- **Article 293 and state borrowing**
- **System science**
- **Mains**



Q "Article 293 provides constitutional mechanism for fiscal consolidation but not without dilution of fiscal federalism" Discuss

"अनुच्छेद 293 राजकोषीय समेकन के लिए संवैधानिक तंत्र प्रदान करता है लेकिन राजकोषीय संघवाद को कमजोर किए बिना नहीं"



The hindu analysis by saurabh pandey sir

Q Heat waves has multidimensional impact therefore solution demands multipronged strategy "Discuss" (Aech to IMD) —

→ Heat waves is defined as the maximum temp of a weather reaches at least 40°C in the plains & at least 30°C in hilly regions. with a departure of around $4.5-6.5^{\circ}\text{C}$ from the normal max. temp.

Multidimensional impact of heat waves —

- Occuring of El-Nino event which causes weak rainfall & more heat over india
- heat redistribution affect airflows above the ocean since the pacific ocean covers almost $(\frac{1}{3})$ of the earth changes in its temp. & changes in wind pattern can disrupt weather worldwide
- Scarcity of surface water result in reduction of yield retineely impact agriculture
- Reduce labour force capability of long hrs work.
- Melting of glacier rapidly → drying up of river.
- Resulting in excess use (AC, refrigerator etc) ↑ greenhouse gases → ↑ global warming
- Create disturbance in marine eco-system
- Harmful for environment → animal, forest fire, river system etc.
- Resulting in disease spread & favourable for many virulent pathogen such as Blast of rice
- Cancer patient cure through chemotherapy & they require moderate or cool temp. the HW could prove bad for them & painful.

UPSC


Multipronged strategy -

- Adaptation & mitigation both are required for tackling HD
- install cool or green roofs, Use of greenhouse technology for agriculture.
- operate summer cooler instead of air conditioner & earthen pot for cold water than of refrigerator
- At backyard practice kitchen gardening, meadow orchard with combination of climber & shrubs work for dual purpose beauty as well as fresh air.
- Avoid clearing of forest area for converting it into concrete building.
- est. of natural park, biodiversity, insitu conservation, gene pool
- operate solar heater, cooker, lantern, ponds etc
- Grow millet in ^{area of} scarce water

The 28th meeting of COP to UNFCCC focuses on global goal for adaptation (GGA)

- Area mostly south of equator are vulnerable to HD



fig - Show severely affected and due to heatwave by 

Steps taken by the Government :-

(i) World's governments at the New Delhi Declaration, have signed a Global Partnership on Ai (GPAi) for Responsible Ai, Data Governance, and addressed concerns around misinformation and disinformation, personal rights and threat to human rights and democratic values.

(ii) Deepfake Regulation → Sec. 66E of the IT Act, deals with deepfake crimes. Sec. 67, 67A, 67B deals with prosecution of such involved individuals. IPC sec. 509, 499, 153(a), (b) also associated with deepfake crimes.

(iii) The EU Ai Act has ~~not~~ been approved for greater restrictions and scrutiny of Ai content.

Things to be done :-

(i) Need of a regulator like SEBI for Ai.

(ii) Risk-based approach for Ai deployment in India.

~~(iii)~~

Ai sure has a lot of benefits, but the concerns also exist, which could erode the trust in the democratic institutions.

"Resource accessibility can be a reason for maritime dispute between countries." Discuss. (10m)

Marine resources act as an asset to the economy of nation. It encompasses valuable elements and materials found in the ocean, including biological diversity, fish and seafood, oil, gas, minerals, sand, gravel, renewable energy sources, tourism potential, and unique ecosystems such as coral reefs.

SIGNIFICANCE OF RESOURCES

→ Economic importance

* Fisheries, mineral resources, oil, gas

* Strategic Importance

* for maintaining maritime security

→ Environmental importance

* Maintaining ecological balance, preventing sea-level rise, ocean acidification

→ Transportation and Connectivity

* Extensively cheap way of transportation, good connectivity facilitates trade in effective manner.

→ Tourism and Recreation

* Generates revenue and employment opportunities for coastal communities.

RECENT INCIDENTS OF MARITIME DISPUTE

① Dispute in South China Sea: territorial disputes b/w China, Taiwan, Brunei, Malaysia, Philippines, Vietnam

② Arctic and Bering Sea dispute b/w Russia and USA

③ Katchatheevu Issue: Indian government gave away this island to the Sri Lankan government and till this day there is



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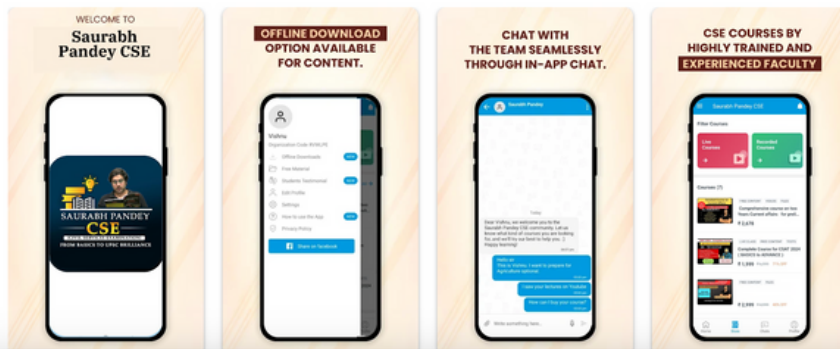
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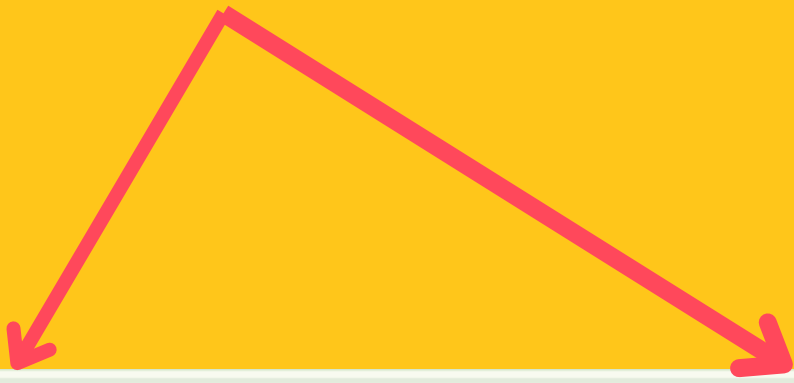
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SAURABH PANDEY
CSE
(CIVIL SERVICES EXAMINATION)
FROM BASICS TO UPSC BRILLIANCE

India among countries mulling telescopes on, around the moon

Astronomers are now seriously considering an idea they have toyed with since the 1950s: placing optical and radio telescopes on the moon's far side. The pristine, airless desolation here provides crystal-clear seeing conditions throughout the long lunar night, which lasts two weeks at a time

Prakash Chandra

Astronomers are looking forward to opening a new window on the universe by posting high-resolution telescopes on the moon and in orbit around it. There are numerous proposals to do this from astronomers around the world, including one from India called PRATUSH.

On the earth, optical telescopes (which collect visible light at longer wavelengths) and radio telescopes (which collect radio waves with the shortest wavelengths) have to peer through layers of the planet's atmosphere. While it is becoming increasingly difficult for optical instruments to see through the polluted skies, radio telescopes also contend with radio and TV signals adding to the cacophony of the electromagnetic 'hiss' from the communications channels used by radar systems, aircraft, and satellites. It also does not help that the earth's ionosphere blocks radio waves coming from outer space.

A pristine desolation

Scientists tried to find a way out of this by launching radio telescopes into orbit around the earth. But this only made the problem worse, as orbiting telescopes started receiving radio noise from the whole planet along with signals from outer space. So astronomers are now seriously considering an idea they have toyed with since the 1950s: placing optical and radio telescopes on the far side of the moon, which always faces away from the earth.

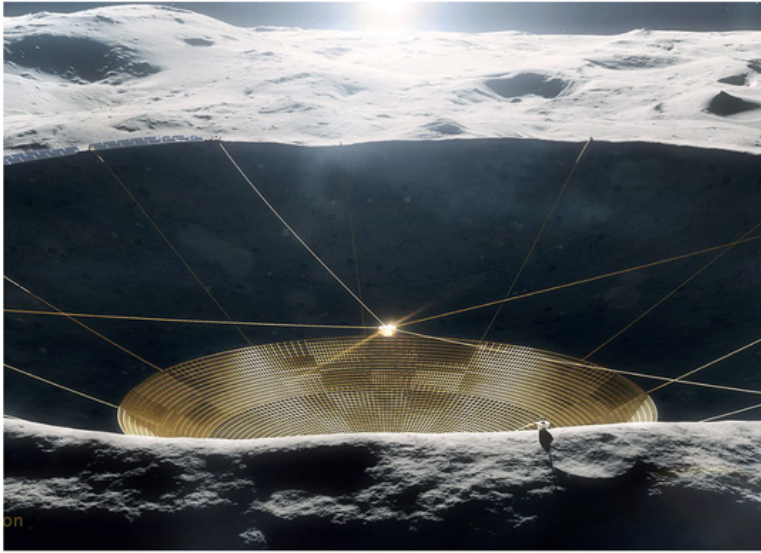
The pristine, airless desolation of the moon provides optical telescopes crystal-clear seeing conditions throughout the long lunar night, which lasts two weeks at a time. Radio telescopes on the lunar far side will also be protected by a 3,475-km-thick wall – a.k.a. the moon (its diameter is 3,476 km) – that blots out radio transmissions from the earth and electrically charged plasma winds blowing from the Sun.

In the past, the enormous costs involved discouraged scientists from setting up lunar telescopes. But renewed interest among spacefaring nations to return to the moon promises to open up "the most radio-quiet location in the solar system", to quote The Royal Society, to astronomers.

The oldest light in the universe

Once upon a time, cosmologists believe, everything in the cosmos was condensed into an infinitesimally small, incredibly dense blob in the void that exploded with a 'Big Bang'. The resulting fireball cooled as it spread and its blinding light faded into a gathering darkness. At some point, the young universe resembled a formless sea of murky matter, highlighted only by traces of primordial hydrogen and helium.

This darkness persisted from some 300,000 to half a billion years after the Big Bang, which is why there is so little direct evidence today of this important period in the cosmic story. The blackness in the heavens was banished only when the first stars switched on their nuclear power-plants and the cosmos continued to expand. We see this expansion now as a faint glow called the cosmic microwave background (CMB), the oldest light in the



The moon's surface is covered in craters and one of these natural depressions could provide a support structure for a radio telescope dish, like this concept art for the NASA Lunar Crater Radio Telescope shows. VLADIMIR VUSTYANSKY/NASA

universe, which can be captured by radio telescopes.

Meanwhile, the universe went 'quiet' for tens of millions of years afterwards as gravity began to build the first stars and galaxies. This period of time between the initial scattering of the CMB radiation and the birth of the first stars is known as the Dark Ages. It is believed the neutral hydrogen pervading the cosmos during the Dark Ages absorbed some of the CMB radiation to produce an extremely small dip in the frequency of the spreading radio waves.

China may be the first, again

Terrestrial instruments can't detect this minute frequency dip. Instead, moon-based instruments are our best bet to spot this signal from the Dark Ages, which would be essentially free from the influence of any starlight (since there were no stars then).

"We want to study the Dark Ages period because it connects how the early universe evolved into the universe we see today," Arifogei Suzuki, who heads the Lunar Surface Electromagnetic Experiment, or LuSEE Night, a joint NASA-Berkeley Lab project, scheduled for launch in December 2025, told this author via email. "We are going to land on the far side of the moon, near the equator of the moon, and almost exactly opposite from the earth. This location is helpful because it best shields radio frequency noise coming from the earth."

LuSEE Night will be followed by many moon-bound instruments currently in various stages of planning with space agencies like NASA and the European Space Agency (ESA). NASA's Long-Baseline Optical Imaging Interferometer, for instance, is scheduled



Radio telescopes also contend with radio and TV signals adding to the cacophony of the electromagnetic 'hiss' from communications channels used by radar systems, aircraft, and satellites

to be launched in parts before this decade is out. Once assembled on the moon's far side, it will study magnetic activity on stars and the centres of active galaxies in visible and ultraviolet wavelengths.

ESA is getting ready to launch a radio telescope to the moon's far side on board its lunar lander, 'Argonaut', by 2030. Other European projects on the anvil include super-sensitive detectors to hunt for the elusive ripples of gravitational waves in space-time and an infrared telescope located inside a permanently shadowed crater near the lunar south pole.

First off the block, however, could be China, with a moon-orbiting radio telescope scheduled for launch in 2026. Another of its satellites, Queqiao-2, intended as a communications relay between the earth and future missions, probably entered into orbit around the moon on March 24. Its payload includes a 4.2-m antenna that will be used as, among other things, a radio telescope.

PRATUSH radio telescope

Although the technologies for these instruments exist, it is difficult for scientists to deploy them on the moon. "An alternative approach," Dr. Suzuki said, "would be to orbit ... the moon

instead of landing on the surface and study the data when the satellite is behind the moon."

This is what Indian scientists plan to do with the radio telescope PRATUSH (Probing Reionization of the Universe using Signal from Hydrogen), to study the universe from the moon's far side. PRATUSH is being built by the Raman Research Institute (RRI) in Bengaluru with active collaboration from the Indian Space Research Organisation (ISRO).

Initially, ISRO will place PRATUSH into orbit around the earth. After some fine-tuning, the space agency will launch it moonwards. "Although earth orbit will have significant radio frequency interference (RFI), it will have advantages compared to ground-based experiments, such as operating in free space and lesser ionosphere impact," Mayuri S. Rao and Saurabh Singh, principal investigators at RRI, explained in an email. "PRATUSH in lunar orbit will have the ideal observing conditions operating in free space with minimal RFI and no ionosphere to speak of." It will carry a wideband frequency-independent antenna, a self-calibrating analog receiver and a digital correlator to catch radio noise in the all-important signal from the Dark Ages.

As astronomers open new windows from the moon to look at the far reaches of the universe, who knows what discoveries await them. One thing is certain: they are in for some exciting times as the cosmos yields clues to some of its greatest mysteries, such as dark energy (which pushes the universe in every direction at an accelerating rate), primordial black holes and, indeed, the very nature of the cosmos.

(Prakash Chandra is a science writer.)



The hindu analysis by saurabh pandey sir



Telescopes on, around the moon

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- There are numerous proposals to do this from astronomers around the world, including one from India called PRATUSH.

Challenges

- On the earth, optical telescopes (which collect visible light at longer wavelengths) and radio telescopes (which collect radio waves with the shortest wavelengths) have to peer through layers of the planet's atmosphere.
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Telescope in Moon

- **The pristine, airless desolation of the moon provides optical telescopes crystal-clear seeing conditions throughout the long lunar night, which lasts two weeks at a time.**
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Dark Age

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- This period of time between the initial scattering of the cosmic microwave background (CMB), radiation and the birth of the first stars is known as the Dark Ages
- The Cosmic Microwave Background (CMB) is the cooled remnant of the first light that could ever travel freely throughout the Universe.
- This 'fossil' radiation, the furthest that any telescope can see, was released soon after the 'Big Bang'. Scientists consider it as an echo or 'shockwave' of the Big Bang



- **Lunar Surface Electromagnetic Experiment, or LuSEE Night, a joint NASA-Berkeley Lab project, scheduled for launch in December 2025,-- study the Dark Ages period because it connects how the early universe evolved into the universe we see today.**
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PRATUSH radio telescope

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- As astronomers open new windows from the moon to look at the far reaches of the universe, who knows what discoveries await them



For most people, the determination of which hand is dominant may come down to chance.
SINDY SOSSENGUT/UNSPASH

Genes involved in cell shape offer clues on left-handedness

Reuters

Why are some people left-handed while most are righties? This is an area of active research, and a new study sheds light on a genetic component of left-handedness in some people. Researchers identified rare variants of a gene involved in controlling the shape of cells and found them to be 2.7-times more common in left-handed people.

While these genetic variants account for only about 0.1% of left-handedness, the researchers said the study shows that this gene, called TUBB4B, may play a role in the development of the brain asymmetry that underlies the determination of a dominant hand.

In most people, the two halves, or hemispheres, of the brain have slightly different anatomies and are dominant for different functions.

"For example, most people have left-hemisphere dominance for language and right-hemisphere dominance for tasks that require directing visual attention to a location in space," said neurobiologist Clyde Francks of the Max

The identification of rare mutations in TUBB4B that are more common in left-handers suggests that it is responsible for setting up the brain's normal asymmetries

Planck Institute for Psycholinguistics in the Netherlands, senior author of the study published on April 2 in the journal *Nature Communications*.

"In most people, the left hemisphere also controls the dominant right hand. The relevant nerve fibres cross from left to right in the lower part of the brain. In left-handers, the right hemisphere is in control of the dominant hand. The question is: what causes the asymmetry of the brain to develop differently in left-handers?"

TUBB4B controls a protein that gets integrated into filaments called microtubules that provide internal structure for cells. The identification of rare mutations in this gene that are more common in left-handers suggests that microtubules are involved in setting up the brain's normal asymmetries, Mr. Francks said.

The two cerebral hemispheres start to develop differently in the human embryo, though the mechanism has remained unclear.

"Rare genetic variants in just a handful of people can pinpoint genes that give clues to developmental mechanisms of brain asymmetry in everyone. TUBB4B could be a good example of this," Mr. Francks added.

The findings were based on genetic data covering more than 350,000 middle-aged to older adults in Britain in a dataset called the U.K. Biobank. About 11% were left-handed.

For most people, the determination of which hand is dominant may come down to chance.

"We think that most instances of left-handedness occur simply due to random variation during development of the embryonic brain, without specific genetic or environmental influences. For example, random fluctuations in the concentrations of certain molecules during key stages of brain formation," Mr. Francks said.





TUBB4B

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- In most people, the two halves, or hemispheres, of the brain have slightly different anatomies and are dominant for different functions.
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- The identification of rare mutations in this gene that are more common in left-handers suggests that microtubules are involved in setting up the brain's normal asymmetries

Should State Governments borrow more?

How does the Reserve Bank of India categorise the budgetary expenditures of the Union and State governments? What has been Kerala's track record when it comes to spending on the social sector? From where do State governments receive their funds?

ECONOMIC NOTES

Jayan Jose Thomas

The financial relation between the Union and various State governments has been a matter of vigorous debate. In a recent development, the Government of Kerala has approached the Supreme Court for a resolution of the following question: how much can the State government borrow from the market to bridge the excess of its expenditures over receipts? The Union government says that the borrowing should be limited to 3% of the State's income or Gross State Domestic Product (GSDP). Kerala contends that by curtailing its borrowing powers, the Centre is undermining the State's ability to fulfil some of its basic financial commitments and violating the principle of federalism.

How States spend more

It is well known that in India the power to raise taxes rests largely with the Union government while a greater part of the overall government spending is done by the State governments. More importantly, when it comes to spending on sectors which affect people's daily lives, the overwhelming responsibility lies on the shoulders of the State governments. On social services, which include health and education, the expenditure incurred in 2022-23 was ₹2,230 billion (₹ billion = ₹100 crore) by the Union government while the combined expenditure by all State governments was ₹19,182 billion. The expenditures of all the States put together was bigger than the expenditure of the Union by 8.6 times in social services as a whole; 2.6 times in education; and by 3.8 times in health.

Of course, the spending priorities of the Union and the States are guided by the constitutionally allocated powers and functions for them. Compared to its expenditure on social services, the Union government's spending on defence was approximately twice as high, while its spending on transport, urban development and energy combined was 2.4 times higher.

The Reserve Bank of India (RBI) has categorised the budgetary expenditures by the Union and the State governments as 'developmental' and 'non-developmental'. The former includes expenditures on social services and economic services (such as on agriculture and industry) while the latter refers to interest payments, pensions, subsidies, and so on. It is remarkable that developmental expenditures, and within that, the expenditures on social services incurred by the State governments have risen significantly over the last two decades. As a proportion of the country's Gross Domestic Product (GDP), the combined developmental expenditures by all State governments increased from 8.8% in 2004-05 to 12.5% in 2022-22. On the other hand, the social and developmental expenditures by the Union government remained somewhat unchanged over the two-decade period. The upsurge in spending during the 2008-12 period was reversed over the next eight years, with a brief revival after 2020 (Chart 1). In the end, it was the spending by the State governments that has helped to alleviate the livelihood crisis in the country, caused due to the slow growth of rural incomes and employment.

Kerala's experience

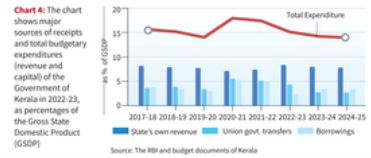
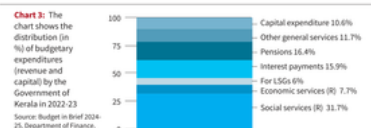
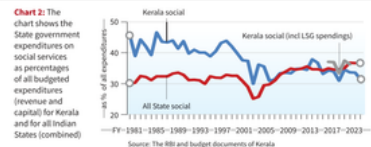
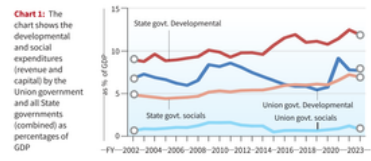
Kerala provides an excellent illustration of the power of government spending to positively transform a region's economy

A Union-State expenditure comparison

The RBI has categorised budgetary expenditures by the Union and the State governments as 'developmental' and 'non-developmental'. A look at these expenditures in different sectors over the years



A common issue: Delhi Chief Minister Arvind Kejriwal, Kerala Chief Minister Pinarayi Vijayan, Punjab Chief Minister Bhagwant Mann and others during a protest against the Centre over distribution of Central funds to States, at Jantar Mantar, in New Delhi on February 8. SHASHI SHENAI/KANSAS



and society. The expenditure on education, health and other social sectors as a proportion of the total budgeted expenditures by the State government in Kerala ranged between 40% and 50% for four decades, from the 1960s until the end of the 1990s. The proportion of social sector spending in Kerala was way ahead of the corresponding average of all other States until the middle of the 2000s. From the mid-2000s, while the average proportion of all other States rose

covering day-to-day expenses. In fact, the large body of teachers, nurses, and other government employees in Kerala – half of them women – have been a key driver of the State's social achievements over the decades.

At the same time, the pensions paid to retired government employees as well as to members of the disadvantaged sections (such as the elderly, agricultural workers, widows) make up 16.4% of all budgeted expenditures by the Kerala government. This is markedly higher than the average proportion allotted for pensions by all Indian States (9.7%). It is indeed a concern that only 10.6% of Kerala's budgetary resources was directed to capital expenditure (in 2022-23), which is much lower than the average of all Indian States (18.0%). This means that, in 2022-24, the State government could meet its modest budget expenditure, equivalent to 14.2% of GDP, only by raising the borrowing to 3.4% of the GDP – which, however, would cross the borrowing limit set by the Centre (Chart 4).

The Supreme Court has now referred Kerala's plea for additional borrowing to a Constitution Bench.

A case for more government spending

For Kerala to translate its enormous advantage in the social sphere to advances in domestic income creation, there needs to be more – not less – government spending.

Especially so on higher education and research that will help build a facilitative environment for a knowledge-driven economy. Given the current state of federal fiscal relations, such an increase in government spending can occur only with greater market borrowings.

A large part of the government borrowing in Kerala, as elsewhere in India, is from domestic financial institutions, including public sector banks and insurance companies, which mobilise savings from the wider public. Kerala is a region with a large reserve of private savings, which could be channelled for productive purposes.

The concerns about debt-financed government expenditures are often exaggerated. Economists in the Keynesian tradition have shown that government borrowing can generate a virtuous cycle if the borrowed resources are deployed effectively to create new incomes and jobs. Many of the development dilemmas that Kerala faces today – an ageing population, the large outgo for pensions, outmigration of its youth – are problems that most other States will also face in the coming years. The Union and the State governments should join hands to ward off these challenges. On its part, Kerala should be able to convince that its borrowing is part of a larger plan to rebuild the economy and not a firefighting exercise to meet immediate financing needs.

Jayan Jose Thomas is a Professor of Economics at the Indian Institute of Technology Delhi.

THE GIST

▼ In a recent development, the Government of Kerala has approached the Supreme Court for a resolution of the following question: how much can the State government borrow from the market to bridge the excess of its expenditures over receipts?

▼ State governments receive funds from three sources: own revenues (tax and non-tax); transfers from the Union government as shares of taxes and as grants; and market borrowings.

▼ The concerns about debt-financed government expenditures are often exaggerated. Economists in the Keynesian tradition have shown that government borrowing can generate a virtuous cycle if the borrowed resources are deployed effectively to create new incomes and jobs.





Article 293 & state borrowing

- **Article 293, which confers executive power on the States to borrow money within limits prescribed by the State legislature.**
- **It also allows the Union to extend loans and guarantees to the States, and requires the Centre to give its consent and impose conditions for States to raise further loans while earlier ones are outstanding.**
- **Kerala contends that the Article does not confer on the Centre any power to regulate all State loans and that it can impose conditions only on borrowings from the Centre**



- **The Union government says that the borrowing should be limited to 3% of the State's income or Gross State Domestic Product (GSDP).**
- **Kerala contends that by curtailing its borrowing powers, the Centre is undermining the State's ability to fulfill some of its basic financial commitments and violating the principle of federalism.**

How States spend more

- **power to raise taxes rests largely with the Union government while a greater part of the overall government spending is done by the State governments.**
- **More importantly, when it comes to spending on sectors which affect people's daily lives, the overwhelming responsibility lies on the shoulders of the State governments.**



- the spending priorities of the Union and the States are guided by the constitutionally allocated powers and functions for them.
- Compared to its expenditure on social services, the Union government's spending on defence was approximately twice as high, while its spending on transport, urban development and energy combined was 2.4 times higher.
- The Reserve Bank of India (RBI) has categorised the budgetary expenditures by the Union and the State governments as 'developmental' and 'non-developmental'.
- The former includes expenditures on social services and economic services (such as on agriculture and industry) while the latter refers to interest payments, pensions, subsidies, and so on.
- It is remarkable that developmental expenditures, and within that, the expenditures on social services incurred by the State governments have risen significantly over the last two decades.



- **State governments receive funds from three sources: own revenues (tax and non-tax); transfers from the Union government as shares of taxes and as grants; and market borrowings. □**
- **The concerns about debt-financed government expenditures are often exaggerated.**
- **Economists in the Keynesian tradition have shown that government borrowing can generate a virtuous cycle if the borrowed resources are deployed effectively to create new incomes and jobs**

Systems science for a better future

The Pew Research Center surveyed the citizens of many countries in 2023 to gauge how many prefer authoritarian rulers to multi-party democracy. The numbers choosing dictators will dismay democrats. In the Global South: India (85%), Indonesia (77%), South Africa (66%) and Brazil (57%). In the West: the United Kingdom (37%) and the United States (32%), which are significant numbers too. China and Russia were not surveyed.

Citizens of democratic countries have lost trust in their governments' economic policies. Average incomes may be rising but the very rich are becoming much richer, faster. Large corporations and financial institutions are compelling governments to set the rules of the game in their favour by reducing taxes for them, emasculating labour institutions, and exploiting the natural environment for their profit.

Moreover, the growth of the global economy and human population has brought humanity to the brink. Scientists predict that the overuse of fossil energy for fuelling modern consumptive lifestyles will make life on earth impossible beyond this century. Water, fundamental for life, is also running out. India is among the most water stressed large countries in the world.

India has 17.5% of the world's population living on only 2.4% of the world's land. In 2014, India ranked 155 out of 178 countries in the global Environment Performance Index, meanwhile, in 2022, India slipped to the very bottom – 180 out of 180. India, also the world's most populous country, has an additional problem, viz. to increase the incomes of its citizens faster. While economists chase GDP targets, inequality is increasing and we are spilling the earth which supports the economy and sustains our lives.

The science of systems

Keeping the forest in sight, do not get lost in the trees, is good advice. Many things must be known, and their interconnections mapped, to understand how the world works. All sciences – social, medical, and natural – are fragmented into narrow silos. Locked within their echo-chambers, scientists in different disciplines do not learn from each other. As the sciences advance, experts know more but about less. No



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Guide for Systems
Leaders'

Rather than specialised sciences focused on parts, a higher-level science is required – one of holistic, self-adaptive systems

one sees the whole. Politics and economics are integral parts of complex social systems. It is moot whether the weakening of democratic institutions empowers large capitalist institutions or whether capitalist institutions corrode democracy. What has broken down is the comprehension of complex systems with diverse forces, and human egos, within them.

Economics emerged as a distinct science out of philosophy and the humanities in the early 20th century. Modern economists do not understand how societies function. By the century's end, free market fundamentalism had become an ideology. Leave it to the "invisible hand" of the market because it knows best, these economists say. Behind the invisible hand is the power of capital. The rights of capital, and its freedom to roam the world across national boundaries and make more profits, trump the rights of human beings moving across borders searching for safer lives.

Systems' knowledge has been devalued by specialisation. Heart specialists can keep the heart alive with amazing technologies. Brain specialists delve deeper into the biology of the brain. They lose sight of the whole human being. Climate scientists research how to remove carbon from the atmosphere, but the effects of their solutions on the livelihoods of citizens are not in their science's scope. High-tech solutions can improve parts of complex systems while reducing overall health and well-being.

Any intelligence within a system cannot comprehend the system that produced it. Modern science gave human beings hubris that they could conquer "unruly nature" as Francis Bacon declared at the emergence of the European Enlightenment. The arrogant scientific man thought he could change the system that had created him. His scientific fixes of the world, and scientific improvements of his own genes, are threatening humanity's existence.

In times of uncertainty, people yearn for certainty. They follow godmen, dictators, and wealthy technologists because these people claim to know the truth and have the power to apply it. When economists and scientists with their incomplete understanding of the world become the guides of leaders and steer social and economic policies, the losers are both common

people and the natural environment that sustains everyone's lives. Recalling the idea of the ancient Greek poet Archilochus – "A fox knows many things, but a hedgehog knows one big thing" – philosopher Isaiah Berlin divided thinkers into "foxes" and "hedgehogs". Great writers, like Leo Tolstoy, who combined many perspectives in their histories were both hedgehogs and foxes, Berlin said. They understood the fundamental nature of existence and the limits of any rational scientific approach to it.

Rather than specialised sciences focused on parts, a higher-level science is required: a science of holistic, self-adaptive systems which include human egos in them. Complex self-adaptive systems have three components: systems being, systems thinking, and systems acting. Systems being requires humility. Systems thinking requires the mind of the "hedgehog-fox" to see patterns among the details.

Enterprises for cooperation

Systems acting to improve the world for everyone must be driven by organisations whose purpose is cooperation, not by organisations driven by competition. The purpose of business corporations and armies is to make more profit and gain more power, whereas the purpose of families is to improve the well-being of their members. Family members have natural differences in sex and generational abilities. Yet, they cooperate with each other for the well-being of all.

Women's contributions to the well-being of families and societies are under-valued in money terms and not counted in GDP. Economists say that few Indian women are in the labour force, whereas, for centuries, women have been working harder than men, producing social and economic value for their families and communities.

The world needs more caring, less competition. Women are natural family builders and systems facilitators whereas men are brought up to compete. Rather than men teaching women to think like men and compete with them in hierarchies of the formal labour force, men must learn the caring ways of women to make the world better for everyone.



What is system science??

- **Systems Science, also referred to as systems research, or, simply, systems, is a transdisciplinary field that is concerned with understanding simple and complex systems in nature and society, which leads to the advancements of formal, natural, social, and applied attributions throughout engineering, technology and science, itself.**
- **To systems scientists, the world can be understood as a system of systems.**
- **The field aims to develop transdisciplinary foundations that are applicable in a variety of areas, such as psychology, biology, medicine, communication, business, technology, computer science, engineering, and social sciences**

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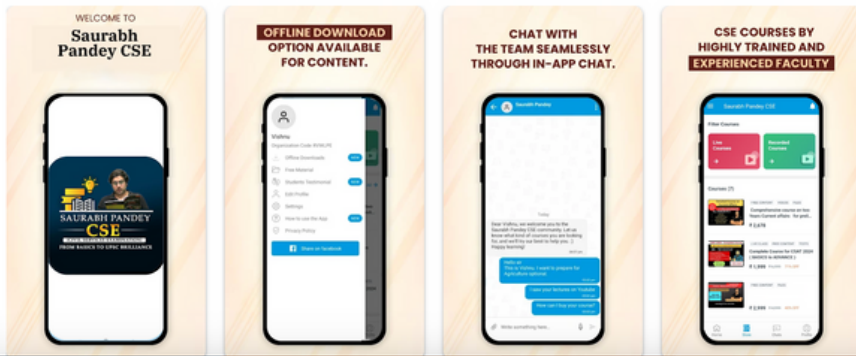
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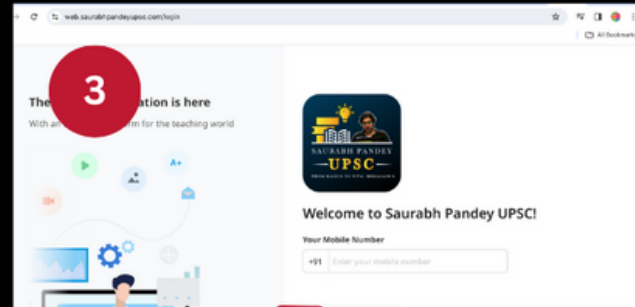
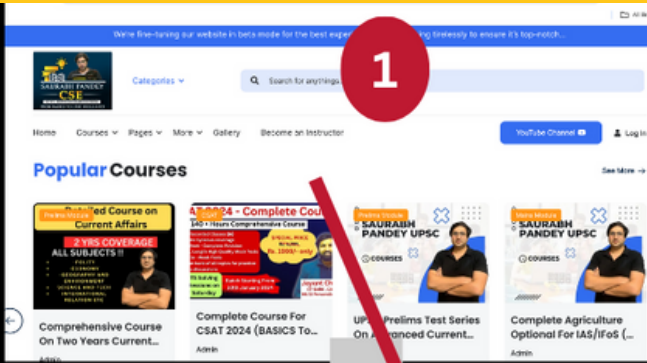
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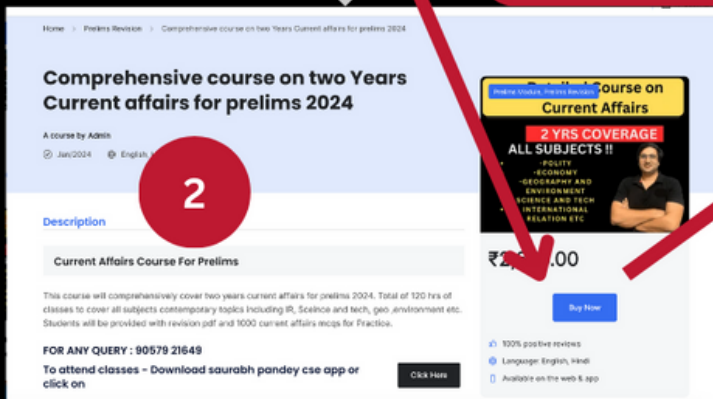
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