

DAILY CURRENYTS AFFAIRS (05 August 2024)

TOPICS COVERED

1. Kerala asks Centre to declare landslides a 'national disaster'
2. Nine children killed in M.P. as house wall collapses
3. MGNREGS: States fall behind in paying unemployment aid (GS Paper-II: Schemes)
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**दिल्ली से भी बेहतर आपके शहर गोरखपुर में**

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# MGNREGS: States fall behind in paying unemployment aid

Only ₹90,000 released in 2023-24 as allowance for workers who are not provided jobs under the scheme; report says such figures do not reflect true demand and rural economic distress

GS Paper II:  
Schemes

NEW DELHI

Going against one of the key objectives of the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), only ₹90,000 was released by various States in 2023-24 as “unemployment allowance”, which is provided to workers in case of unmet work demand. The corresponding figure was ₹7.8 lakh in 2022-23.

The Economic Survey, 2024, tabled in Parliament on July 22, pointed out that these figures were clearly deficient and did not reflect the correct picture with regard to unmet work demand. The survey noted that work was often unavailable for beneficiaries and that block-level functionaries may not register demand for work in real time. “Consequently, formal data showing MGNREGA work demand may not reflect the true demand and current rural economic distress,” it said.

The survey also pointed out the flaw in the reporting system of MGNREGS, underlining that work demanded is only reported on the portal when employment is actually pro-



**Major problem:** In 2022-23 and 2023-24, only six States paid the unemployment allowance to workers. FILE PHOTO

vided. “Presumably to save on the State government’s liability towards unemployment allowance.”

Under Section 7(1) of the MGNREGA, 2005, “If a person applying for employment under the scheme is not employed within 15 days, he shall be entitled to a daily unemployment allowance.” The law states that this allowance shall be one-fourth of the wage rate for the first 30 days of the financial year and half of the wage rate for the remainder.

Low disbursement of unemployment allowance is one of the chronic problems in implementation of the Act. In 2022-23 and 2023-24, only six States paid the al-

lowance. In the two financial years before that – 2021-22 and 2020-21 – only three and four States, respectively, disbursed the allowance. In 2019-20, no State disbursed funds.

Nikhil Dey of Mazdoor Kisan Shakti Sangathan (MKSS), one of the authors of the Act, said “unemployment allowance” was introduced in the law to fix accountability for the States and is a key tool to ensure that States provide work under the law that rests on the assured employment principle. It also remains one of the most underutilised clauses because of several administrative deficiencies. “The short answer to the ques-

tion, ‘who is responsible for such low figures of unemployment allowance?’, is of course the States, but the long answer is more complicated. One of the key reasons MGNREGS job cardholders are unable to receive the allowance is that they rarely are handed out the receipt registering their demand. This could be blamed on antipathy or inefficiency of the block-level administration. But often we find that the State governments are squeezed between the beneficiaries and chronic under-budgeting for the scheme by the Centre,” he said.

In a report of the Parliamentary Standing Committee on Rural Development tabled in February this year, other than providing a State-wise account of the allowance disbursement, the only response available from the Ministry of Rural Development on this issue was that they will “look into it”. The Standing Committee recommended that the Centre should take up the matter at the “highest level” with the States and Union Territories concerned “so that the State governments do not fail in their statutory duties to provide the unemployment allowance”.

## MGNREGS: States fall behind in paying unemployment aid (05 August)

Only ₹90,000 released in 2023-24 as allowance for workers who are not provided jobs under the scheme; report says such figures do not reflect true demand and rural economic distress

- In 2023-24, only ₹90,000 was released by various States as “unemployment allowance” under the MGNREGS.
- This amount is significantly lower than the ₹7.8 lakh released in 2022-23.
- The Economic Survey 2024 highlighted that these figures do not accurately reflect the true unmet work demand.
- Work is often unavailable for beneficiaries, and block-level functionaries may not register work demand in real time.
- As a result, the formal data on MGNREGA work demand may not represent the actual demand and current rural economic distress.
- The Economic Survey 2024 noted a flaw in the MGNREGS reporting system, where work demand is only recorded when employment is provided, potentially to reduce state liability for unemployment allowance.
- According to MGNREGA 2005, if employment is not provided within 15 days, individuals are entitled to a daily unemployment allowance.
- The allowance is one-fourth of the wage rate for the first 30 days and half of the wage rate for the remainder of the financial year.
- Low disbursement of unemployment allowance is a recurring issue.

- In 2022-23 and 2023-24, only six States paid the allowance.
- In 2021-22 and 2020-21, only three and four States paid it, respectively.
- In 2019-20, no State disbursed the allowance.
- Nikhil Dey of MKSS said that the unemployment allowance in MGNREGS was meant to ensure accountability and enforce the law's guarantee of employment.
- Despite its importance, the allowance is often underutilized due to administrative issues.
- States are responsible for the low figures of unemployment allowance, but the issue is complex.
- Job cardholders frequently do not receive receipts for their demand, which can be due to inefficiency or reluctance from block-level administration.
- State governments often struggle with under-budgeting for the scheme by the central government, impacting the disbursement of the allowance.
- The Parliamentary Standing Committee on Rural Development's February report highlighted issues with unemployment allowance disbursement.
- The Ministry of Rural Development responded by stating they would "look into it."
- The Committee recommended that the Centre address the issue at the highest level with States and Union Territories.
- This action is suggested to ensure States fulfill their legal obligation to provide the unemployment allowance.

# Ceramic: a material for the ages

## GS Paper III: S&T

Take some nonmetallic, inorganic material and fire it to a high temperature, and you'll have a ceramic. The word comes from the Greek *keramos*, or "potter's clay," speaking to a common application of ceramics in ancient times.

This said, there is evidence of humans having made and used ceramic objects for more than 25,000 years. Archaeologists have discovered ceramic pottery and figurines in the ruins of various ancient civilisations, including those in the Indus Valley and in Keezhadi in Tamil Nadu. The colours found on these materials, their shapes and designs, and their purposes have hinted at their origins and the processes the members of each civilisation used to make them.

Ceramics can typically withstand very hot or acidic environments, many forms of chemical erosion, and are hard and difficult to compress. But they are also brittle — i.e. can shatter — and don't handle shear, or sliding, stress well.

The science of preparing and studying ceramics' microscopic properties is called ceramography. In modernity, scientists have used ceramics on space shuttles (as part of the heat shield during atmospheric reentry) to produce



Ceramic pottery on display at a museum of prehistory in Berlin. EINSAMER SCHÜTZE (CC BY-SA 3.0)

heat in microwave furnaces, as abrasives, in the production of varistors and semiconductors, as nuclear fuel, in fighter aircrafts' windows, and in tomographic scanners, among other settings. The discovery of high-temperature superconductivity in some ceramic materials won two scientists the 1987 physics Nobel Prize.

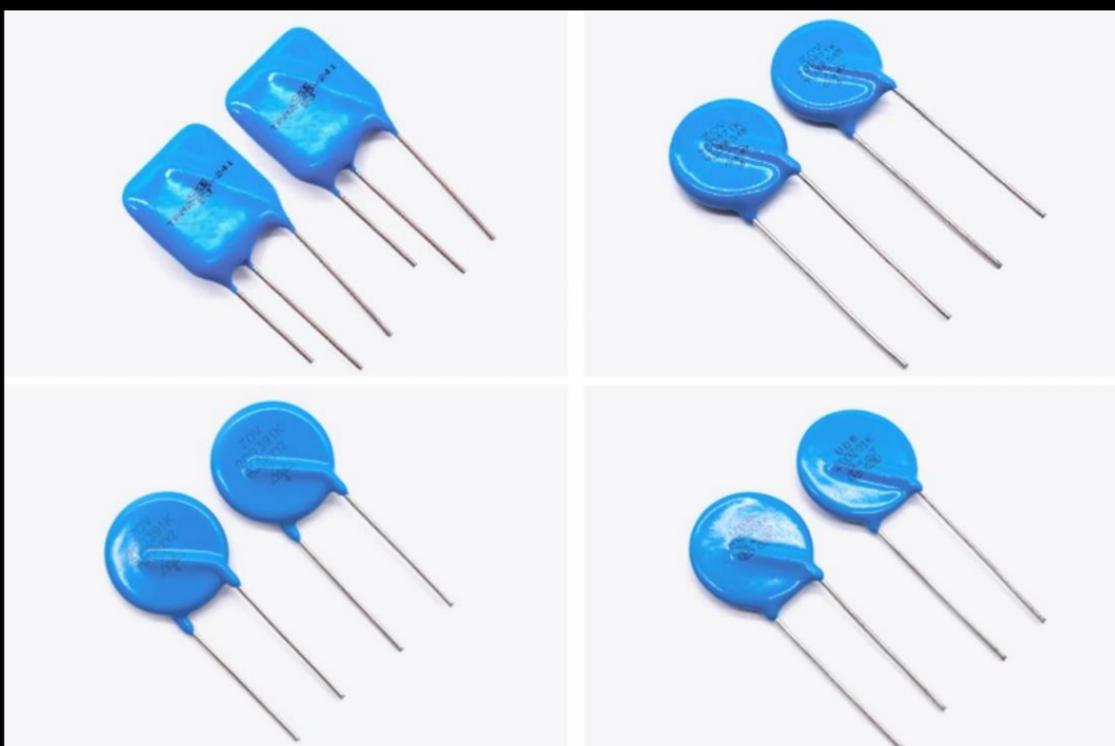


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## Ceramic: a material for the ages (05 August)

- Ceramic materials are made by heating nonmetallic, inorganic substances to high temperatures.
- The term "ceramic" comes from the Greek word "keramos," meaning "potter's clay," reflecting its historical use in pottery.
- Evidence shows that ceramics have been used for over 25,000 years.
- Archaeologists have found ceramic pottery and figurines from ancient civilizations, such as those in the Indus Valley and Keezhadi in Tamil Nadu.

- The colors, shapes, and designs of these ceramics provide insights into their origins and manufacturing processes.
- Ceramics are durable and resistant to high temperatures, acids, chemical erosion, and compression.
- However, they are brittle and can shatter easily, and they don't handle sliding stress well.
- The study of ceramics and their microscopic properties is known as ceramography.
- Ceramics are used in various modern applications, including:
  - Space shuttle heat shields
  - Microwave furnaces
  - Abrasives
  - Varistors and semiconductors
  - Nuclear fuel
  - Fighter aircraft windows
  - Tomographic scanners
- High-temperature superconductivity in ceramics led to a Nobel Prize in Physics for two scientists in 1987.



Patriotic IAS

# The psychology of extravagance

## GS Paper III: Inequality

If anything, the undignified display of wealth by a billionaire during and in the run-up to a recently held family wedding shows how vanity clouds the capacity of most Indian billionaires to recognise the stark contemporaneity of their *folies de grandeur*, inequality, and abject poverty. Economists Nitin Kumar Bharti, Lucas Chancel, Thomas Piketty, and Anmol Somanchi, in their March 2024 study titled “Income and Wealth Inequality in India, 1922-2023: The Rise of the Billionaire Raj”, inform us that in 2022-23, the top 1% income and wealth shares were 22.6% and 40.1%, respectively.

### A case of gross disproportion

In real terms, the top 1% possesses an average of ₹54 million in wealth (40 times the average Indian) while the bottom 50% and the middle 40% hold ₹0.17 million (0.1 times the national average) and ₹0.96 million (0.7 times the national average), respectively. If this was not stunning enough, the wealthiest 10,000 individuals (out of 920 million Indian adults) own an average of ₹22.6 billion in wealth which is a mind-boggling 16,763 times the average Indian.

Even more shocking is that nearly 90% of the billionaire wealth in 2022-23 was held by upper castes. Other Backward Classes owned less than 10% and Scheduled Castes a meagre 2.6% while Scheduled Tribes found no representation among the wealthiest Indians.

As for abject poverty, although the NITI Aayog reported that 135 million Indians successfully escaped multidimensional poverty between 2016 and 2021, of which nutrition is a component indicator, a report titled “The State of Food Security and Nutrition in the World” (released on July 24 by a consortium of international organisations including the World Health Organization) stated that in 2022, a whopping 56.5% Indians were unable to afford “a healthy diet”, the average cost of which for Asia was “4.20 PPP [purchasing power parity] dollars” per person per day.

To be specific, almost 790 million people in India are not in a position to spend ₹350 daily on healthy food. In this context, the reportedly massive \$600 million (about ₹5,000 crore) price tag of the wedding mentioned above may be contrasted with ₹1,271 crore (about \$152 million) a leading business group (which the family referred to above owns) spent on corporate social responsibility (CSR) activities in the financial year 2022-23.

This distressing reality begs the question: what motivates billionaires to spend several times more on orgies of extravagance than for social welfare?

The American economist, Thorstein Veblen,



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Popular religions have tried to open the eyes of the deprived masses but there appears to be seemingly inexplicable appreciation of the rich by the poor and the middle-class

grappled with such questions in one of his scathing indictments of the profligacy of affluent American societies entitled “The Theory of the Leisure Class”. Veblen wrote, “conspicuous consumption of valuable goods is a means of reputability to the gentleman of leisure”, who, to “put his opulence in evidence” seeks “the aid of friends and competitors” by giving them “valuable presents and expensive feasts and entertainments.”

The scale of this extravagance is deliberately kept so large that it renders impossible what Veblen calls “pecuniary emulation” by others. It is this “invidious pecuniary comparison”, he suggests, that motivates wealthy narcissists to stay above the rest through wasteful expenditure.

### On entitlement and psychological capture

If Veblen’s analysis explains the pomposity of billionaires, the political philosophy of Harvard professor, Michael J. Sandel, examines the mindset that claims the right to wasteful expenditure.

In his book, *The Tyranny of Merit*, Sandel blames the entitlement mentality of the rich for their claim to absolute ownership of their wealth, and the freedom to splurge it. To reach this conclusion, Sandel relies on John Rawls’s “negative argument” (no individual can stake a sole claim to success because success depends on fortunate circumstances in early life for which one cannot claim credit), and Austrian economist Friedrich Hayek’s “affirmative argument” (the successful are obligated to contribute to the common good of the community which makes their success possible).

Sandel argues that the refusal to recognise the realities highlighted in these two arguments has led the rich to believe that their talents entitle them to the bounty that the market bestows upon them, and, by extension, the poor deserve their fate for their lack of merit.

Sandel is right because it is the entitlement mentality of the rich that justifies their right to spend their resources following the whims of elitism to not just enhance their social standing among their peers but also to look down upon the economically disadvantaged as “losers” and make them feel almost unwanted.

It is no wonder that most wedding extravaganzas are hotbeds of classism where the poor and the ordinary are deliberately excluded to let a large section of the international high society celebrate the occasion in perverse isolation. If at all, members of the “lower class” may get entertained on a different day as if to remind them of their position in society and the billionaire host’s magnanimity.

But what is astonishing is that the “lower

classes” seem to have undervalued themselves and, as a result, become resigned to their “lower status” and start believing in the upper class’s absolute right to its wealth and wasteful expenditure.

An international newspaper covering the wedding mentioned above quoted a “middle-class mechanic” in Mumbai: “Look, [the billionaire] earned his money, and it’s his right to spend it on his own children.” The mechanic wanted the filling of potholes, and “a solution to the knee-deep floodwater that ruined businesses during every monsoon and turned alleys into canals of floating trash.” Nothing more.

Sociologist Michèle Lamont speaks of this middle-class peculiarity in her book, *The Dignity of Working Men*. She writes that a large section of the middle class American “white blue-collar workers” have little resentment toward those who do well. This attitude, she points out, is consistent with surveys showing that many Americans believe that the current distribution of rewards is fair, that opportunity is available to all, and that people can make it if they work at it.

This seemingly inexplicable appreciation of the rich by the poor and the middle-class amounts to a kind of psychological capture of the poor and the middle-class by the rich, made possible by the unabashed propagation of the myth of meritocracy, despite popular religions having tried for centuries to open the eyes of the deprived masses.

### Rights of the underprivileged

For instance, almost a millennium-and-a-half ago, the *Koran* issued a radical statement on the rights of the underprivileged which warned that wealth is god-given and the rich only hold it as trustees (*mustakhlafeen*) on behalf of the poor. Hence, the supplicant (*saa'il*) and the deprived (*mahroom*) have, “a recognised right” (*haqqun ma'loomun*) in it. (57: 7 and 70: 23-25) By introducing the doctrine of trusteeship, and using the word “right” in place of “charity”, the *Koran* not just redefined the idea of wealth-ownership but expanded the rights of the poor to bring them on a par with the rich in every aspect of life, thus restoring their dignity. The *Koran* even suggests that human miseries and happiness result from circumstantial randomness. (2:155)

This is perhaps what Sandel meant when he concluded his book with an aphorism to sober up the meritocratic rich: “There, but for the grace of God, or the accident of birth, or the mystery of fate, go I.”

One can only hope that Michael Sandel’s moral philosophy will sooner rather than later get the better of the atomistic individualism that shapes the billionaire-mindset.

## The psychology of extravagance (05 August)

- A recent family wedding highlighted the stark display of wealth by an Indian billionaire, showing a disconnect from the country's issues of inequality and poverty.
- Economists Nitin Kumar Bharti, Lucas Chancel, Thomas Piketty, and Anmol Somanchi published a study in March 2024 on income and wealth inequality in India.
- In 2022-23, the top 1% of Indians held 22.6% of the income and 40.1% of the wealth.
- The top 1% possessed an average of ₹54 million in wealth, 40 times the average Indian.
- The bottom 50% and middle 40% held ₹0.17 million (0.1 times the national average) and ₹0.96 million (0.7 times the national average), respectively.
- The wealthiest 10,000 individuals owned an average of ₹22.6 billion in wealth, 16,763 times the average Indian.
- Nearly 90% of billionaire wealth was held by upper castes, with Other Backward Classes owning less than 10%, Scheduled Castes 2.6%, and Scheduled Tribes having no representation among the wealthiest.
- NITI Aayog reported that 135 million Indians escaped multidimensional poverty between 2016 and 2021, including improved nutrition.
- However, a 2022 report by international organizations, including the World Health Organization, revealed that 56.5% of Indians couldn't afford a healthy diet.
- The average cost of a healthy diet in Asia was \$4.20 PPP per person per day.
- Nearly 790 million Indians can't spend ₹350 daily on healthy food.
- The wedding mentioned earlier cost around \$600 million (₹5,000 crore).
- In comparison, the family's business group spent ₹1,271 crore (\$152 million) on corporate social responsibility in 2022-23.

- This disparity raises questions about billionaires' motivations for spending more on extravagant events than on social welfare.
- Thorstein **Veblen**, an American economist, explored the extravagance of affluent societies in his work "The Theory of the Leisure Class."
- Veblen argued that wealthy individuals use "**conspicuous consumption**" to display their wealth and reputability.
- They host expensive events and give valuable gifts to showcase their opulence, making it impossible for others to emulate their level of spending.
- This "invidious pecuniary comparison" drives wealthy individuals to distinguish themselves through wasteful expenditure.
- Harvard professor Michael J. Sandel's political philosophy further examines the mindset that justifies such wasteful spending.
- Michael J. Sandel, in "**The Tyranny of Merit**," **attributes the entitlement mentality of the rich to their belief in absolute ownership of their wealth and freedom to spend it.**
- Sandel uses John Rawls's "negative argument" (success depends on early life circumstances) and Friedrich Hayek's "affirmative argument" (the successful should contribute to the community) to support his views.
- Sandel argues that ignoring these realities leads the rich to believe their talents entitle them to their wealth, while the poor deserve their fate due to a lack of merit.
- This mentality justifies the rich spending lavishly to boost their social standing and look down on the poor as "losers."
- Wedding extravaganzas often exclude the poor and ordinary people, allowing the elite to celebrate in isolation.
- The "lower classes" may be entertained separately, reinforcing their lower status and the billionaire host's perceived generosity.
- The poor and middle class often accept their lower status and believe in the upper class's right to wealth and lavish spending.
- A Mumbai mechanic expressed acceptance of a billionaire's spending, desiring only basic infrastructure improvements.
- Sociologist Michèle Lamont notes that many middle-class American workers feel little resentment toward the wealthy, believing in meritocracy and fair reward distribution.
- This acceptance reflects a psychological capture by the rich, perpetuated by the myth of meritocracy, despite religious teachings aimed at enlightening the deprived masses.

#### Rights of the underprivileged

- The Koran teaches that wealth is god-given and the rich hold it as trustees for the poor.
- The underprivileged have a recognized right to wealth, not just charity.
- This doctrine redefines wealth ownership and elevates the rights and dignity of the poor to be equal to the rich.
- The Koran also suggests that human fortunes are due to circumstantial randomness.
- Michael Sandel emphasizes this idea, urging the meritocratic rich to recognize their success as partly due to luck.
- Sandel's moral philosophy challenges the individualism that shapes the mindset of billionaires.

#### Veblen good

- A **Veblen good** is a product for which demand increases as the price increases.
- This is because such goods are seen as status symbols and are valued for their exclusivity. Unlike typical goods where demand falls as prices rise, Veblen goods have an upward-sloping demand curve.

#### Characteristics of Veblen Goods

- **High-Quality and Exclusive:** These goods are usually well-made and luxurious.
- **Status Symbols:** They are sought after by wealthy consumers who value their exclusivity.
- **Upward-Sloping Demand Curve:** As the price rises, the demand for these goods increases.

#### Examples of Veblen Goods

- Designer jewelry
- Expensive watches
- Luxury cars

#### Contradiction to Conventional Market Forces

- Veblen goods contradict the basic law of demand, which states that demand decreases as prices increase.
- For Veblen goods, higher prices make them more desirable to status-conscious consumers.
- If the price of these goods is lowered, they lose their appeal because they become less exclusive.

#### Comparison with Giffen Goods

- **Veblen Goods:** Luxury items like designer clothes and high-end cars. Demand increases with price due to their status symbol value.
- **Giffen Goods:** Essential goods like rice or potatoes. Demand increases with price due to lack of substitutes. Giffen goods are rare and debated among economists.

#### Causes of the Veblen Effect

- **Perceived Quality:** Higher prices are often associated with better quality, even if it's not true.
- **Exclusivity:** Consumers feel more exclusive and important when purchasing expensive goods.
- **Limited Availability:** Items that are hard to obtain, like rare art pieces, command higher prices due to their scarcity.

2024\_08\_05

MAINS PRACTICE QUESTION

Essay Paper

**Question:** The Intersection of Wealth, Vanity, and Socio-Economic Disparities in India.

(500 Words/62 Marks)

प्रश्न: भारत में धन, घमंड और सामाजिक-आर्थिक असमानताओं का अंतर्संबंध।

(500 Words/62 Marks)

**Approach:**

- The conspicuous consumption and extravagant displays of wealth by the ultra-rich in India, particularly during events such as weddings, starkly highlight the deep socio-economic disparities in the country.
- Despite the visible inequality, there is often a surprising acceptance or even admiration of such lavishness among the middle and lower classes.
- This phenomenon can be understood through the lenses of Thorstein Veblen's theory of conspicuous consumption and Michael J. Sandel's critique of the entitlement mentality of the rich.
- Additionally, religious and philosophical doctrines have long argued for the moral responsibility of the wealthy towards the less fortunate.

**1. Conspicuous Consumption and Socio-Economic Inequality:**

- Analyze how Veblen's concept of conspicuous consumption is manifested in modern Indian society.
- Evaluate the impact of such extravagant displays of wealth on the socio-economic fabric of the country.

**2. Entitlement Mentality and Social Responsibility:**

- Explain Michael J. Sandel's arguments regarding the entitlement mentality of the rich and their implications for social justice.
- Discuss the role of meritocracy in shaping the attitudes of the wealthy and its acceptance among the less affluent.

**3. Moral and Ethical Perspectives on Wealth Distribution:**

- Compare and contrast the moral philosophies of Sandel and religious teachings, such as those from the Koran, on the responsibilities of the wealthy.
- Propose measures that can bridge the gap between the wealthy and the underprivileged, emphasizing both ethical considerations and practical solutions.

**4. Policy Implications and Future Directions:**

- Critically assess current policies addressing income and wealth inequality in India.
- Suggest policy interventions that can mitigate the adverse effects of wealth concentration and promote a more equitable society.

**Instructions:**

- Your essay should be well-structured and logically organized, with clear introductions and conclusions for each section.
- Use appropriate references and citations to support your arguments.
- Ensure that your discussion reflects a deep understanding of the theoretical frameworks and their application to contemporary Indian society.
- Highlight both the challenges and potential solutions, demonstrating a nuanced perspective on the issue of wealth inequality.

Note: Use relevant examples and case studies to support your arguments. Reflect on the broader implications of wealth disparity for India's socio-economic development and suggest a balanced approach to foster inclusivity and social justice.

# Stalked by polio, Gaza faces another siege

GS Paper III: Internal Security,  
Ethics: IV

The United Nations Office for Disarmament Affairs describes biological weapons as those that “disseminate disease-causing organisms or toxins to harm or kill humans, animals or plants”.

War itself is a nasty thing during which humans, animals, and plants are killed en masse. We often contend today with the death of animals and plants in the context of climate change – mindful of the role of animals in maintaining ecosystem services and the carbon sequestration potential of plants – and know that the remains of incendiary explosives and building debris drive toxic effects, often entrenched enough for their effects to last for generations. This is separate from the large carbon footprints of armies in motion plus the operations required to equip them.

Climate change can also create environments conducive to the spread of some disease-causing microbes. The chemically toxic outcomes of war can diminish people's and the beleaguered state's ability to respond optimally to this challenge, allowing these dysfunctional environments to persist and sow more threats. The operations of the conflict itself can finally strike a killing blow by bombing hospitals, blocking medical aid, and cutting off water and electricity supplies – such as what Israel has been doing in Gaza.

## Israel's statement

In the third week of July, Israel's Health Ministry said it had found poliovirus particles in the sewage flowing out of Gaza. Haaretz reported that the Israel Defense Forces (IDF) responded by initiating a campaign to vaccinate its soldiers in Gaza and those slated to enter the territory. As of July 21, the IDF reportedly said it had not recorded any clinical cases of poliomyelitis but expected there to be an outbreak.

This is a debatable statement for two reasons. First, according to the UN, as of May 21, 2024,



Vasudevan Mukunth

Should Israel continue to sustain harmful living conditions in Gaza, the outcomes of its actions will be indistinguishable from those of biological warfare

“only around one-third of Gaza's 36 hospitals still function, leaving critical health care facilities inaccessible to patients and healthcare workers impacted by the violence or evacuation orders.” As Israeli bombs have devastated hospitals and civilian shelters and ground forces have restricted access to medical aid, a Gazan is not likely to be diagnosed with a poliovirus infection except by aid workers at shelters, which are also grossly overcrowded, or in areas outside the conflict zone.

Second, the poliovirus is an obligate human pathogen, meaning it can replicate only inside cells of the human body. This virus has no other known animal reservoirs. So, if Israeli researchers have detected poliovirus in Gaza's sewage, the virus must already have infected some residents of Gaza. On July 29, Gaza's Health Ministry declared a polio “epidemic” in the Gaza Strip.

The severity of infections is of course unknown. But equally, allowing the virus to spread is irreconcilable with the efforts of most of the rest of the world to eradicate polio, which – after three decades of intense efforts – is currently limited to cases of wild poliovirus type 1 in rural Pakistan and Afghanistan. The virus circulating in Gaza is believed to be vaccine-derived poliovirus type 2.

## The danger of spread

If medical conditions in Gaza do not improve post haste, the infectious poliovirus may win back one more territory for itself and endanger the Israeli population as well. According to the Global Polio Eradication Initiative's Global Polio Surveillance Action Plan (GPSAP) 2022-2024, “The capacity to consistently detect and respond to poliovirus detection is ultimately dependent on existing within-country capacity – and fragile states, especially those with ongoing conflict, are especially vulnerable.” The virus itself is unforgiving: by 2022, Malawi and Mozambique in

Africa had reported their first cases of wild poliovirus infections in three decades after the COVID-19 pandemic dented local childhood immunisation drives for a year. In late 2023, the World Health Organization had recorded Gaza's immunisation rates to have declined to 89% from 99% a year earlier. But while Israel has claimed to have delivered 0.3 million vaccines to the Palestinians in Gaza since its offensive began in October 2023, according to the BBC, the IDF also plans to continue its military operations and has instructed its soldiers to steer clear of consuming water in Gaza. They will be supplied with millions of units of bottled water instead.

## Damaged infrastructure

On the other hand, Israel has damaged or destroyed water infrastructure in the embattled parts of Gaza such that they no longer have the ability to treat wastewater. Marwa Daoudy, the Seif Ghobash Chair in Arab Studies at Georgetown University, told *The Hindu* last year that as a result, “raw sewage water [flows] straight into the sea”. “I saw the line going down to the sea and children bathing not far away from it,” she added. Note that the poliovirus may also spread through contaminated water.

Some public health experts in Israel have already called for a ceasefire to prevent what they have dubbed a “polio epidemic among Gazans and Israeli babies”. So did WHO Director-General Tedros Adhanom Ghebreyesus, who on July 26, added that the organisation is sending more than one million polio vaccines to the region. Should Israel continue to deny these pleas and sustain harmful living conditions for the millions of Gazans, and deny them access to health care and better standards of living, the outcomes of its actions will be indistinguishable from the outcomes of biological warfare.

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## Stalked by polio, Gaza faces another siege (05 August)

- The UN describes biological weapons as those that spread disease-causing organisms or toxins.
- War results in mass deaths of humans, animals, and plants.
- Climate change highlights the importance of animals and plants for ecosystems and carbon sequestration.
- War leaves behind toxic effects from explosives and debris, impacting generations.
- Armies in motion and their operations have large carbon footprints.
- Climate change can aid the spread of disease-causing microbes.
- War's toxic outcomes hinder the ability to respond to these microbial threats.
- Conflict operations can exacerbate the situation by destroying hospitals, blocking medical aid, and cutting off essential supplies, as seen in Gaza.

### Israel's statement

- In July, Israel's Health Ministry found poliovirus in Gaza's sewage.
- The Israel Defense Forces (IDF) started vaccinating soldiers in Gaza.
- As of July 21, no clinical polio cases were reported by the IDF, but an outbreak was expected.
- Gaza's healthcare is severely compromised, with only a third of hospitals functional.
- Israeli bombings and ground forces have restricted access to medical aid, making polio diagnosis unlikely except by aid workers.
- Poliovirus can only replicate in human cells, indicating some Gaza residents are infected.
- On July 29, Gaza's Health Ministry declared a polio epidemic.
- The severity of infections is unknown.
- Allowing the virus to spread conflicts with global efforts to eradicate polio, now mostly limited to rural Pakistan and Afghanistan.
- The virus in Gaza is vaccine-derived poliovirus type 2

### The danger of spread

- If Gaza's medical conditions don't improve quickly, the infectious poliovirus could spread further, endangering the Israeli population.
- The Global Polio Eradication Initiative highlights that fragile states, especially those in conflict, are vulnerable to poliovirus outbreaks.
- In 2022, Malawi and Mozambique reported their first wild poliovirus cases in three decades due to disrupted immunization drives during the COVID-19 pandemic.
- Gaza's immunization rates dropped from 99% to 89% by late 2023.
- Israel claims to have delivered 0.3 million vaccines to Palestinians in Gaza since October 2023.

- Despite this, the IDF plans to continue military operations and has advised soldiers to avoid drinking Gaza's water, providing them with bottled water instead.

#### Damaged infrastructure

- Israel has damaged water infrastructure in Gaza, preventing **wastewater treatment**.
- Raw sewage flows directly into the sea, where children are bathing, raising the risk of poliovirus spread through contaminated water.
- Some Israeli public health experts have called for a ceasefire to prevent a "polio epidemic among Gazan and Israeli babies."
- WHO Director-General Tedros Adhanom Ghebreyesus announced the organization is sending over one million polio vaccines to the region.
- If Israel continues harmful actions and denies better living conditions and healthcare to Gazans, the consequences could be akin to biological warfare.

## Election overhang (05 August)

#### Inflation remains a concern as price pressures broaden beyond food

- In June, production in India's eight core infrastructure sectors slowed down due to reduced state spending on public works following the general election and extreme heatwaves.
- Output in five of the core sectors either grew more slowly or contracted compared to the previous year.
- Overall core sector growth dropped to 4%, the lowest in 20 months.
- Refinery products, with the highest weight in the Index of Eight Core Industries (ICI), saw a 1.5% decline in output.
- Electricity generation fell by 3.6% from May's peak, with annual growth slowing from 13.7% to 7.7%.
- Steel production decreased by 4% from the previous month due to decreased demand from the heatwaves, with annual growth slowing to 2.7%.
- Coal production grew by 14.8%, up from 10.2% in May, providing a positive note amid the overall slowdown.
- The HSBC India Manufacturing PMI for July slightly decreased to 58.1 from 58.3 in June, indicating a minor slowdown in manufacturing activity.
- The survey found that manufacturing output and new orders grew more slowly.
- A significant increase in input costs led manufacturers to raise selling prices at the highest rate in nearly 11 years.
- Costs for coal, packaging, paper, rubber, and steel have risen, suggesting a broadening of inflation beyond just food prices.
- The Reserve Bank of India's Monetary Policy Committee faces a challenge in managing inflation as price pressures extend to various sectors.

### The core sectors

- They are fundamental to India's economic growth and development.
- These eight key industries form the backbone of the nation's infrastructure and play a vital role in supporting other sectors.
- The core sector under **Ministry of Commerce and Industry**, Government of India.

#### The Eight Core Sectors:

1. **Coal:** A primary source of energy for power generation in India.
2. **Crude Oil:** Though India imports a significant portion of its crude oil needs, domestic production remains crucial for energy security.
3. **Natural Gas:** An increasingly important cleaner-burning fuel source for power generation and industrial applications.
4. **Refinery Products:** The processing of crude oil into various petroleum products like petrol, diesel, and LPG.
5. **Fertilizers:** Essential for agricultural productivity, ensuring food security for the nation.
6. **Steel:** A critical material for construction, infrastructure development, and various industrial applications.
7. **Cement:** The binding agent used in construction activities, vital for building infrastructure and housing.
8. **Electricity:** The foundation of modern economies, powering homes, industries, and essential services.

- **Coal:** 10.33%
- **Crude Oil:** 8.98%
- **Natural Gas:** 6.88%
- **Refinery Products:** 28.04%
- **Fertilizers:** 2.63%
- **Steel:** 17.92%
- **Cement:** 5.37%
- **Electricity:** 19.85%

the battle to fame inflation.

GS Paper II: FR

## Medieval-minded

### Amendments to U.P.'s anti-conversion law worsen its unconstitutional features

The amendments adopted by the Uttar Pradesh Assembly to make its regressive anti-conversion law more stringent seems to have ease of its misuse as its principal aim. The original law, enacted in 2021, led to the registration of over 400 cases by 2023. The amendments seek to increase the jail terms prescribed under the Uttar Pradesh Prohibition of Unlawful Conversion of Religion Act, 2021. If minors, women or "certain communities" were the target of conversion through use of force, threat or coercion, it could entail imprisonment up to 20 years and even for life. It also prescribes a stiff sentence and fine for receiving funds from foreign organisations for the purpose of unlawful conversion. A concerning feature is the introduction of stringent requirements for grant of bail that enhance the purported gravity of the offence. The amended law states that a person accused under the Act cannot be granted bail, unless the public prosecutor has been given an opportunity to oppose it, and that there should be reason to believe that the accused is not guilty of the offence, and is unlikely to repeat it while out on bail. The section is similar to the bail-denying provisions in the NDPS Act and the PMLA.

Another new feature, by which anyone can file a complaint against supposedly forcible or fraudulent conversions, is reprehensible, as it gives communal organisations and sundry busybodies to get those opting for or supporting an inter-faith marriage arrested. Earlier, only an aggrieved person, that is, the victim or a close family member, could file a complaint against unlawful conversion. The move to amend the provision is likely motivated by the fact that bail has been granted to many arrested under this Act because the complainants were not aggrieved parties in those cases. The idea of giving more teeth to the law is rooted in the claim that the cases of "forced conversions" are on the rise in the State, but whether such a spike is a fact or a result of the widespread misuse of the Act against those opting for inter-faith marriages is something to be studied. The validity of the law has always been in doubt, inasmuch as it tries to criminalise inter-faith marriages by treating "conversion by marriage" as one of the means of 'unlawful conversion', by declaring marriages for the purpose of conversion as null and void, and mandating prior intimation to the authorities for those intending to change their religion. The amendments worsen the multiple violation of fundamental rights and betray a medieval-mindedness unbecoming of a democratic government functioning under a forward-looking Constitution.

## Medieval-minded (05 August)

### Amendments to U.P.'s anti-conversion law worsen its unconstitutional features

- The Uttar Pradesh Assembly has amended its anti-conversion law to make it stricter.
- The original 2021 law led to over 400 cases by 2023.
- The amendments increase jail terms for unlawful conversions, with penalties of up to 20 years or life imprisonment if minors, women, or certain communities are targeted.
- The amendments also impose stiff penalties and fines for receiving foreign funds intended for unlawful conversion.
- The new law makes it harder to get bail, requiring the public prosecutor to oppose bail and proving that the accused is unlikely to repeat the offense. This is similar to provisions in other stringent laws like the NDPS Act and PMLA.
- The new amendments allow anyone to file complaints about alleged forcible or fraudulent conversions, which could lead to misuse by communal organizations and individuals against inter-faith marriages.
- Previously, only victims or close family members could file such complaints.
- The amendment aims to address cases where bail was granted because the complainants were not directly affected.
- The justification for the amendments is a claimed rise in forced conversions, but it's unclear if this is due to actual increases or misuse of the law.
- The law has faced criticism for criminalizing inter-faith marriages, declaring such marriages as void if they are deemed to be for conversion, and requiring prior notification for religious conversions.
- The amendments are seen as a violation of fundamental rights and reflect a regressive mindset contrary to democratic and constitutional values.

# What do scientists make of the Budget?

While in the Budget presentation the Finance Minister listed many priority areas, such as productivity and resilience in agriculture, energy security, and manufacturing and services, there are also concerns about the sidelining of basic research and stagnation in research funding as a percentage of GDP

GS Paper III: S&T

## FULL CONTEXT

T.V. Padma

The previous two terms of the Narendra Modi government saw the launch of some major national advanced technology missions, including for supercomputing, cyber-physical systems, and quantum technologies. These were coupled with initiatives to boost private sector participation in space and geospatial policies. India became the fourth country to have a spacecraft's lander touch down successfully on the moon. In parallel, there were concerns about the sidelining of basic research and stagnation in research funding as a percentage of GDP, and the nitty-gritties of operating the Anusandhan National Research Foundation (ANRF).

### What do leading scientists make of the new Budget in Modi's third term?

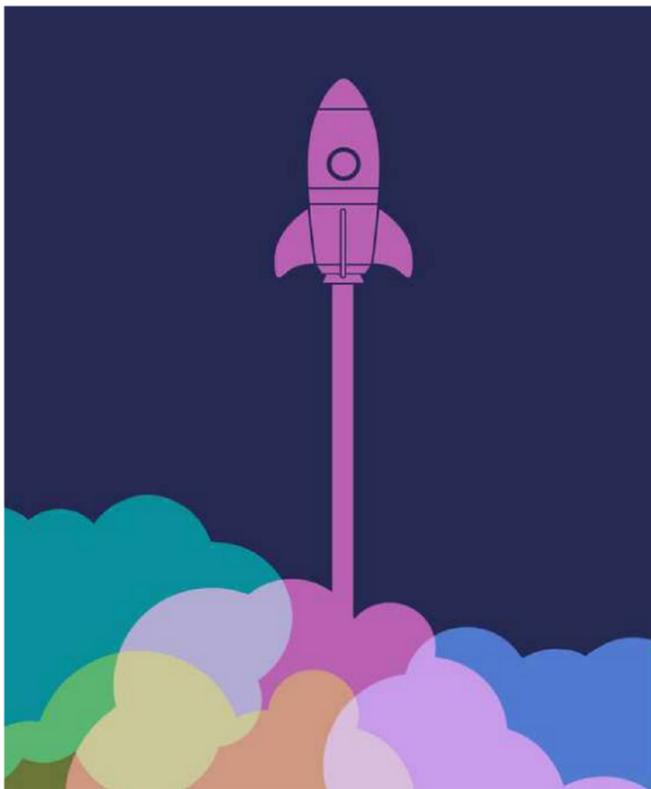
According to N. Kalaiselvi, Director-General, Council of Scientific and Industrial Research (CSIR), continuing with the focus on 'Viksit Bharat' like last year, this year's Union Budget also spurs research and development in important areas such as climate-resilient agriculture, critical minerals, miniature and modular nuclear energy technology, energy-efficient technologies, etc. Under the Budget priority entitled "Innovation, Research and Development", the Finance Minister has clearly emphasised basic research and prototype development, including innovation and industry linkages.

While in the Budget presentation the Finance Minister listed nine priorities, in addition, there are a few other priority areas, such as "Productivity and Resilience in Agriculture", "Energy Security", and "Manufacturing and Services", which are also focus areas of CSIR. The proposed "Critical Minerals Mission" and the exemption of customs duties on 25 critical minerals will significantly boost critical minerals research. Another area of national importance and global relevance is clean energy. Water supply, sewage treatment and solid waste management also figure as priority areas. CSIR is into technology development in all these areas.

The plan for "plug and play" industrial parks in 100 cities and the creation of a dozen industrial parks under the National Industrial Corridor Development Programme will provide significant opportunities for the uptake of indigenous technologies like those from CSIR labs. Importantly, there is a clear focus on commercialising technologies with the involvement of private sector-driven research.

To meet the fund requirements for various R&D activities as mandated by the Government of India, during the Financial Year 2024-25, the Finance Minister has earmarked an allocation of ₹6,323.41 crore for the Department of Scientific and Industrial Research. The CSIR budget has increased by 10%, above last year's. We will put in our best efforts to sustain our R&D activities in the allotted budget, and in case of further need, we will approach the Ministry of Finance at the time of revised estimates.

Rajesh Gokhale, Secretary, Department of Biotechnology (DBT) said that the Union Budget presented by the Finance Minister lays emphasis on transforming agriculture research in the country. The focus is on productivity and climate resilience in agriculture. The DBT established "speed breeding platforms" in



GETTY IMAGES

the International Rice Research Institute (IRRI)'s South Asia Regional Centre in Varanasi; Punjab Agricultural University, Ludhiana; and the National Agri-Food Biotechnology Institute, Mohali, to shorten the developmental cycles of agricultural crops with improved attributes and climate resilience. Take for example the rice crop. In field conditions, rice can be grown for a maximum of two to three generations in a year's time. In a speed breeding facility, four to six generations of rice crop is grown in a single year.

Further, several agricultural crop varieties with climate resilient and high productivity traits are being developed through phenotyping and genotyping the genetic resources pertaining to rice, wheat, chickpea, linseed, niger, safflower, sesame, green gram, cowpea, black gram, moth bean, horse gram, and rice bean.

Skilling of human resources to mobilise young minds towards futuristic innovations is also required at doctoral/PhD training [levels], which is traditionally an individual enterprise. The recently launched I3C BRIC-RCB PhD programme, designed to solve national problems through collaborations, espouses multi-disciplinary learning. This will inculcate innovation as well as skilling and create scientists with cross-disciplinary expertise in areas of biosciences and biotechnology.

The angel tax abolition is a major incentive for start-ups raising private capital. For the high risk biotechnology sector, the angel tax was a discouragement to attract investments. The 2024 Budget announcement will pave the way for investment inflow – a very welcome step for promoting deep-tech life sciences start-ups. When seen in conjunction with provisions for FDI promotion in the Budget, this will create a robust pipeline of angel-funded portfolio companies ready to be picked up by VC firms post-BIRAC funding for high-risk and early-stage ideas. [BIRAC is the

Biotechnology Industry Research Assistance Council.]

R&D efforts in our country are primarily academia-centric. Most often the innovations that occur at the laboratory level fail to get commercialised. To bridge this gap, R&D efforts in private companies on equal footing is required. In this direction, operationalisation of the ANRF for basic research and prototype development with a corpus of ₹1 lakh crore will pave the way for private sector-driven research and innovation.

However, Subhash Lakhotia, Distinguished Professor, Banaras Hindu University remarked that the actual expenditure of Science and Technology (S&T) and higher education in 2023-2024 was much less than the initial allocation for that year. The suggested allocations for 2024-2025 are not very different from that in 2022-2023 because of this reason. They may deceptively appear much greater than last year, but in most cases the increase appears to be less than 10% of that in 2022-2023. This is indeed disappointing since this nominal increase would be, if it is not already, offset by inflation.

Additionally, because of increasing numbers of public and private institutions, the level of competition has substantially increased. Therefore the quantum available per capita would become much less than in 2022-2023. An additional worry is whether the actual available funds would really match the allocated Budget.

The ANRF could make a small difference if and when this becomes operational. Additionally, it does not seem, as a percentage of the GDP, that the allocation this year has shown any increase. Unless that happens, we will continue at the same level or actually go down. The zero budgeting system (ZBS) and quarterly reports also remain a problem. Quality basic research projects

cannot have a one-to-one correlation between 'targets planned' and 'targets achieved' because in any research effort, there is a lot that remains unknown. Thus the mandated quarterly reports put unnecessary burden and stress on researchers. It is only when the actual results are different from the expected that a real quantum advance happens.

Tapasya Srivastava, professor, Department of Genetics, University of Delhi South Campus said that the previously announced ANRF is to be made operational with a focus on both basic science research as well as prototype development. The interim Budget had already announced a corpus of ₹1 lakh crore for R&D and innovation, to be led by the private sector. The establishment of a separate venture capital fund for space technology also has the potential to spur start-ups. However, given the enormous capital requirements of space tech, the allocation of ₹1,000 crore seems inadequate.

The Budget has announced measures to step up clean energy generation, including solar and nuclear energy, with concerted measures such as reducing taxation on critical input raw materials and minerals. The allocation for the Production Linked Incentive (PLI) scheme for pharmaceuticals increased to ₹2143 crore; it will help boost domestic pharmaceutical manufacturing. But specific announcements for the health of the youth along with employment generation would have been welcome.

The stress on employment generation and the internship scheme would undoubtedly help many students of science get into well-known companies. In the long run, this will encourage students to take up science as a career with opportunities beyond academia.

C.P. Rajendran, National Institute for Advanced Studies, observed that the government plans to set up a venture capital fund of ₹1,000 crore to promote space technology. The government will partner with the private sector to set up small reactors and develop technologies for nuclear energy.

The Finance Minister said they will operationalise the ANRF for basic research and prototype development. What is intriguing is the mention of "prototype" development along with "basic research". Generally, prototype development means the "initial stage of software development" before finally releasing the product in the market or for users. It's not clear as to what prototype development has to do with research in basic sciences. Does it mean the government is only interested in translational research with technological applications? That goes against the stated objectives of the ANRF.

The ANRF was purportedly created to prioritise research facilities in universities and colleges. Most of India's 40,000 higher education centres are run by States and have limited funding opportunities. State establishments get only about 11% of the funds provided by the Department of Science and Technology and 65% of funding goes to IITs under the Union Government. The ANRF wants to change this disparity, but what is the mechanism?

Overall, the Budget allocation has some nominal increases, nothing exciting. A long-standing demand from the scientific community is to arrange for higher government funding because the private sector has not shown much interest in investing in basic research.

T.V. Padma is a science journalist based in New Delhi.

## THE GIST

The previous two terms of the Narendra Modi government saw the launch of some major national advanced technology missions, including for supercomputing, cyber-physical systems, and quantum technologies.

Most often the innovations that occur at the laboratory level fail to get commercialised. To bridge this gap, R&D efforts in private companies on equal footing is required. In this direction, operationalisation of the Anusandhan National Research Foundation (ANRF) for basic research and prototype development with a corpus of ₹1 lakh crore will pave the way for private sector-driven research and innovation.

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## What do scientists make of the Budget? (05 August)

While in the Budget presentation the Finance Minister listed many priority areas, such as productivity and resilience in agriculture, energy security, and manufacturing and services, there are also concerns about the sidelining of basic research and stagnation in research funding as a percentage of GDP

- The Modi government launched major technology missions in supercomputing, cyber-physical systems, and quantum technologies.
- There were initiatives to boost private sector participation in space and geospatial policies.
- India successfully landed a spacecraft on the moon, becoming the fourth country to do so.
- Concerns were raised about the sidelining of basic research and stagnant research funding as a percentage of GDP.
- In Modi's third term, the new Budget continues to focus on 'Viksit Bharat' and spurs research in climate-resilient agriculture, critical minerals, miniature nuclear energy, and energy-efficient technologies.
- The Budget prioritizes innovation, research, prototype development, and industry linkages, as emphasized by the Finance Minister.
- The Budget lists nine priorities, with additional focus on "Productivity and Resilience in Agriculture," "Energy Security," and "Manufacturing and Services."

- The "Critical Minerals Mission" and customs duty exemptions on 25 critical minerals will boost research.
- Clean energy, water supply, sewage treatment, and solid waste management are also priority areas.
- CSIR focuses on technology development in these areas.
- Plans for industrial parks in 100 cities and a dozen parks under the National Industrial Corridor Development Programme will promote indigenous technologies.
- There is an emphasis on commercializing technologies with private sector involvement.
- The Finance Minister allocated ₹6,323.41 crore for the Department of Scientific and Industrial Research for 2024-25.
- The CSIR budget increased by 10% compared to last year.
- CSIR aims to sustain R&D activities within the budget and may seek additional funds if needed.
- The Union Budget emphasizes transforming agricultural research with a focus on productivity and climate resilience.
- The Department of Biotechnology (DBT) established "speed breeding platforms" at various institutions to shorten crop development cycles, enabling four to six generations of rice in a year compared to two to three generations in field conditions.
- Agricultural crop varieties with climate resilience and high productivity traits are being developed through phenotyping and genotyping of genetic resources for various crops.
- Skilling human resources for innovation is required at the doctoral/PhD level.
- The i3C BRIC-RCB PhD program promotes multi-disciplinary learning and collaboration to solve national problems, fostering innovation and cross-disciplinary expertise in biosciences and biotechnology.
- The abolition of the angel tax is a major incentive for start-ups, especially in high-risk sectors like biotechnology.
- The 2024 Budget announcement encourages investment inflow, benefiting deep-tech life sciences start-ups.
- Provisions for FDI promotion will create a pipeline of angel-funded companies ready for VC investment post-BIRAC funding.
- R&D efforts in India are primarily academia-centric and often fail to commercialize innovations.
- The operationalization of the ANRF with a ₹1 lakh crore corpus aims to support private sector-driven research and innovation.
- Subhash Lakhotia notes that actual expenditure on S&T and higher education in 2023-2024 was less than initially allocated.
- Suggested allocations for 2024-2025 are not significantly different from 2022-2023 and may be offset by inflation.
- Increasing numbers of public and private institutions have intensified competition, reducing per capita funding compared to 2022-2023.
- There are concerns that actual available funds may not match the allocated Budget.
- The ANRF could make a small difference if operational, but the percentage of GDP allocation for R&D has not increased.
- The zero budgeting system (ZBS) and quarterly reporting create burdens for researchers, as research outcomes are often unpredictable.
- The ANRF is set to focus on basic science research and prototype development, with a ₹1 lakh crore corpus for R&D and innovation led by the private sector.
- A separate venture capital fund for space technology has potential, but the ₹1,000 crore allocation may be inadequate given the high capital requirements.
- The Budget includes measures to boost clean energy generation, such as solar and nuclear, by reducing taxes on critical raw materials and minerals.
- Allocation for the Production Linked Incentive (PLI) scheme for pharmaceuticals increased to ₹2143 crore to enhance domestic manufacturing.
- Specific measures for youth health and employment generation were expected but not included.
- Emphasis on employment generation and internships will help science students get jobs in reputable companies, encouraging careers in science beyond academia.
- The government plans to set up a ₹1,000 crore venture capital fund for space technology.
- The government will partner with the private sector to develop small reactors and nuclear energy technologies.
- The Finance Minister announced the operationalisation of the ANRF for basic research and prototype development.
- There is confusion about the inclusion of "prototype" development with "basic research," as it typically refers to initial stages of software development.
- Concerns arise that the government may focus more on translational research with technological applications, contrary to the ANRF's objectives.
- The ANRF aims to prioritize research facilities in universities and colleges, addressing the funding disparity where State-run institutions receive only 11% of funds from the Department of Science and Technology, while IITs receive 65%.
- The Budget allocation has some nominal increases but is not very exciting.
- The scientific community has long demanded higher government funding due to limited private sector investment in basic research.

|          |          |          |          |           |           |           |           |           |           |           |           |           |            |           |            |           |            |            |
|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|-----------|------------|-----------|------------|------------|
| Group    | 1        | 2        | 3        | 4         | 5         | 6         | 7         | 8         | 9         | 10        | 11        | 12        | 13         | 14        | 15         | 16        | 17         | 18         |
| Period 1 | 1<br>H   |          |          |           |           |           |           |           |           |           |           |           |            |           |            |           |            | 2<br>He    |
| 2        | 3<br>Li  | 4<br>Be  |          |           |           |           |           |           |           |           |           |           | 5<br>B     | 6<br>C    | 7<br>N     | 8<br>O    | 9<br>F     | 10<br>Ne   |
| 3        | 11<br>Na | 12<br>Mg |          |           |           |           |           |           |           |           |           |           | 13<br>Al   | 14<br>Si  | 15<br>P    | 16<br>S   | 17<br>Cl   | 18<br>Ar   |
| 4        | 19<br>K  | 20<br>Ca | 21<br>Sc | 22<br>Ti  | 23<br>V   | 24<br>Cr  | 25<br>Mn  | 26<br>Fe  | 27<br>Co  | 28<br>Ni  | 29<br>Cu  | 30<br>Zn  | 31<br>Ga   | 32<br>Ge  | 33<br>As   | 34<br>Se  | 35<br>Br   | 36<br>Kr   |
| 5        | 37<br>Rb | 38<br>Sr | 39<br>Y  | 40<br>Zr  | 41<br>Nb  | 42<br>Mo  | 43<br>Tc  | 44<br>Ru  | 45<br>Rh  | 46<br>Pd  | 47<br>Ag  | 48<br>Cd  | 49<br>In   | 50<br>Sn  | 51<br>Sb   | 52<br>Te  | 53<br>I    | 54<br>Xe   |
| 6        | 55<br>Cs | 56<br>Ba | 57-71    | 72<br>Hf  | 73<br>Ta  | 74<br>W   | 75<br>Re  | 76<br>Os  | 77<br>Ir  | 78<br>Pt  | 79<br>Au  | 80<br>Hg  | 81<br>Tl   | 82<br>Pb  | 83<br>Bi   | 84<br>Po  | 85<br>At   | 86<br>Rn   |
| 7        | 87<br>Fr | 88<br>Ra | 89-103   | 104<br>Rf | 105<br>Db | 106<br>Sg | 107<br>Bh | 108<br>Hs | 109<br>Mt | 110<br>Ds | 111<br>Rg | 112<br>Cn | 113<br>Uut | 114<br>Fl | 115<br>Uup | 116<br>Lv | 117<br>Uus | 118<br>Uuo |

|          |          |          |          |          |          |          |          |          |          |          |           |           |           |           |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|
| 57<br>La | 58<br>Ce | 59<br>Pr | 60<br>Nd | 61<br>Pm | 62<br>Sm | 63<br>Eu | 64<br>Gd | 65<br>Tb | 66<br>Dy | 67<br>Ho | 68<br>Er  | 69<br>Tm  | 70<br>Yb  | 71<br>Lu  |
| 89<br>Ac | 90<br>Th | 91<br>Pa | 92<br>U  | 93<br>Np | 94<br>Pu | 95<br>Am | 96<br>Cm | 97<br>Bk | 98<br>Cf | 99<br>Es | 100<br>Fm | 101<br>Md | 102<br>No | 103<br>Lr |

Rare Earth Elements on the Periodic Table

### Critical minerals and Rare Earth Metals (Rare Earth Elements)

- Critical minerals are elements that are vital for the economy and national security but have a high risk of supply disruption.
- These minerals are essential in various high-tech applications, energy production, and manufacturing processes.
- The exact list of critical minerals can vary by country depending on their specific needs and supply chain vulnerabilities.

#### Examples of Critical Minerals:

1. **Lithium:** Used in rechargeable batteries for electric vehicles, smartphones, and laptops.
2. **Cobalt:** Also used in batteries, particularly for its role in stabilizing battery performance.
3. **Nickel:** Important for stainless steel production and batteries.
4. **Graphite:** Used in battery anodes and as a lubricant.
5. **Rare Earth Elements (REEs):** While rare earth elements can also be critical minerals, they are a specific subset with unique properties.

#### Rare Earth Metals (Rare Earth Elements)

- Rare earth metals, or rare earth elements (REEs), are a group of 17 elements in the periodic table, specifically the 15 lanthanides plus scandium and yttrium.
- Despite their name, most rare earth elements are relatively abundant in the Earth's crust, but their extraction and processing are complex and environmentally challenging.
- They are essential for many high-tech applications due to their **unique magnetic, luminescent, and electrochemical properties**.

#### Examples of Rare Earth Metals:

1. **Neodymium:** Used in powerful magnets for wind turbines, electric vehicle motors, and headphones.
2. **Lanthanum:** Used in camera lenses, battery electrodes, and catalytic converters.
3. **Cerium:** Used in catalytic converters, glass polishing, and as a chemical oxidizing agent.
4. **Yttrium:** Used in LED displays, phosphors, and superconductors.
5. **Samarium:** Used in magnets, cancer treatment, and as a neutron absorber in nuclear reactors.

#### Key Differences:

1. **Definition:**
  - **Critical Minerals:** Broad category of minerals essential for economic and national security with potential supply risks.
  - **Rare Earth Metals:** Specific group of 17 elements with unique properties used in various high-tech applications.
2. **Scope:**
  - **Critical Minerals:** Includes a wide range of minerals, such as lithium, cobalt, and graphite, which are not rare earth elements.
  - **Rare Earth Metals:** Limited to the 17 rare earth elements.
3. **Applications:**
  - **Critical Minerals:** Used in diverse applications including batteries, renewable energy, electronics, and manufacturing.
  - **Rare Earth Metals:** Used specifically in applications requiring their unique magnetic, luminescent, and electrochemical properties, such as powerful magnets, LED displays, and certain types of glass and ceramics.

#### Example Overlap:

- **Neodymium** is both a rare earth metal and a critical mineral because it is essential for high-strength magnets used in electric vehicles and wind turbines, and its supply is crucial and potentially at risk.