

# Current Affairs MONTHLY



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By  
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**For HPAS & Other  
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# Contents

|   |    |  |    |
|---|----|--|----|
| <b>CONTENTS</b>   | 2  | Status of transgenic crops in India                                      | 32 |
| <b>GEOGRAPHY</b>  | 3  | Responsibility and the complexities of climate leadership                | 33 |
| Cyclone's effect on monsoon onset   | 3  | The concerns about India-U.S. digital trade                              | 34 |
| <b>POLITY AND CONSTITUTION</b>  | 5  | The Open Market Sale Scheme for wheat and rice                           | 35 |
| Functions and Responsibilities of the Union and the States  | 5  | <b>INFRASTRUCTURE RAILWAYS.</b>  | 37 |
| The United States of India  | 6  | Reforms in Railways  | 37 |
| <b>GOVERNANCE</b>   | 8  | Railway safety   | 38 |
| shrinking space for dissent   | 8  | <b>SCIENCED AND TECHNOLOGY</b>   | 40 |
| <b>INTERNATIONAL RELATIONS</b>  | 9  | fruit fly a test bed for genetic research                                | 40 |
| India-Nepal ties  | 9  | Artificial Intelligence  | 41 |
| frictions in India-Canada ties  | 10 | The remarkable endurance of the Y chromosome, 'master of maleness'       | 42 |
| Lightning Blamed for wildfires  | 11 | Are phonons, particles of sound, quantum too?                            | 43 |
| Next phase of U.S.-India defence ties   | 12 | Remembering Alex Müller for reshaping superconductors                    | 44 |
| Refugees as assets to their new countries   | 13 | An organised counter to organised hate                                   | 46 |
| PM Modi's US Congress address: 'Together, we shall demonstrate that democracies matter and democracies deliver' | 14 | Fibonacci Sequences and Its Significance                                 | 47 |
| Tech is the new driver of India-US diplomacy  | 16 | Laying the foundation for a future-ready digital India                   | 48 |
| US and India: Old friends in a changing world   | 17 | Mahala Nobis in the era of Big Data and AI                               | 49 |
| <b>SOCIAL ISSUES, EDUCATION, HEALTH</b>   | 19 | Chandrayaan-3 to be launched : Chandrayaan-2 and why it partially failed | 50 |
| How long-term stress impacts the intestine and your life  | 19 | <b>ENVIRONMENT</b>   | 52 |
| prioritise the health and nutrition of adolescent girls.  | 20 | Climate breakdown: the Arctic Ocean could ice-free the 2030s             | 52 |
| Non-communicable diseases (NCD) plague Keralites' health  | 21 | What is the New Collective Quantified Goal?                              | 53 |
| Male-centric medicine affecting women's health  | 22 |  |    |
| ranking system of colleges  | 23 |  |    |
| Anxiety disorders and its treatment: the stigma remains   | 24 |  |    |
| Rethinking importance of cord blood in regenerative medicine  | 26 |  |    |
| A model for quality and inclusive education   | 27 |  |    |
| Re-evaluating indiscriminate use of BMI to make conclusions on health   | 28 |  |    |
| <b>ECONOMY</b>  | 30 |  |    |
| Minimum support price: Issues related to direct and indirect farm subsidies                                     | 30 |  |    |
| Unwavering focus on price stability   | 31 |  |    |

# GENERAL STUDIES 1.

## GEOGRAPHY

### CYCLONE'S EFFECT ON MONSOON ONSET

#### Context-

- Global warming's effects on cyclogenesis over the Pacific and North Indian Oceans, the warming over the North Indian Ocean and the late pre-monsoon cyclones and typhoons are another monkey wrench in the monsoons' dynamics – and in the predictions of the monsoon's onset and its evolution through the season.

#### The impact

- We are seeing cyclone formations in the pre-monsoon cyclone season, closer to the monsoon onset, arguably due to the influence of a warmer Arctic Ocean on the winds over the Arabian Sea.
- The monsoon is of course also affected by the three tropical oceans — Indian, Atlantic, and Pacific; the 'atmospheric bridge' from the Arctic; and the oceanic tunnel as well as the atmospheric bridge from the Southern Ocean (a.k.a. the Antarctic Ocean).
- A 'bridge' refers to two faraway regions interacting in the atmosphere while a 'tunnel' refers to two remote oceanic regions connecting within the ocean.

#### Importance of a cyclone's position

- Some cyclones in the North Indian Ocean have had both positive and negative impacts on the onset of the monsoon. Since the circulation of winds around the cyclones is in the anticlockwise direction, the location of the cyclone is critical as far as the cyclone's impact on the transition of the monsoon trough is concerned.
- For example, if a cyclone lies further north in the Bay of Bengal, the back-winds blowing from the southwest to the northeast can pull the monsoon trough forward, and assist in the monsoon's onset as evident with Cyclone Mocha which developed in the first half of May and intensify briefly into a 'super cyclonic storm'.
- One severe consequence of the anomalous anticyclones since March is that both the Arabian Sea and the Bay of Bengal have warmed by more than 1° C in the pre-monsoon season.

#### Mawar, Biparjoy, and Guchol

- Cyclone Biparjoy is not interacting much with the monsoon trough at this time. However, its late birth as well as the late onset of the monsoon are both closely related to typhoons in the northwestern Pacific Ocean.
- On May 19, Typhoon Mawar was born and dissipated by June 3. Mawar qualified as a 'super typhoon' and is thus far the strongest typhoon to have taken shape in May. It is also the strongest cyclone of 2023 so far.
- Tropical storm Guchol is now active just to the east of the Philippines and is likely to continue northwest before veering off to the northeast. These powerful typhoons are thirsty beasts and demand moisture from far and wide.

#### Southwesterly winds

- Cyclone Mawar pulled winds across the equator into the North Indian Ocean, setting up south-westerly winds over parts of the Arabian Sea and the Bay of Bengal.
- Southwesterly' means blowing from the southwest.
- Southwesterly winds over the Arabian Sea are welcome news: they bring large quantities of moisture onto the Indian subcontinent.
- On the other hand, southwesterly winds over the Bay of Bengal are bad news for the monsoon.
- The monsoon winds over the southern Bay of Bengal sweep in from the southwest and west, but they turn around and head northwest towards India from the southeast.

#### Conclusion

- This complicated dance of global warming affecting cyclogenesis over the Pacific and North Indian Oceans, the warming over the North Indian Ocean and the late pre-monsoon cyclones and typhoons together is just another monkey wrench in the monsoons' dynamics — and in the predictions of the monsoon's onset and its evolution through the season. Once seen as a very reliable system, with its annual migration north-westward and the withdrawal south-eastward, the monsoon trough is now being kicked around in the game of climate-change football.



# GENERAL STUDIES 2.

## POLITY AND CONSTITUTION

### FUNCTIONS AND RESPONSIBILITIES OF THE UNION AND THE STATES

**Context:** Sedition law in India

#### What is sedition law?

- The Indian Penal Code defines sedition (Section 124A) as an offence committed when “any person by words, either spoken or written, or by signs, or by visible representation, or otherwise, brings or attempts to bring into hatred or contempt, or excites or attempts to excite disaffection towards the government established by law in India”.
- Disaffection includes disloyalty and all feelings of enmity. However, comments without exciting or attempting to excite hatred, contempt or disaffection, will not constitute an offence under this section.

#### History of Sedition Law in India

- In 1837: Thomas Macaulay (Famous for his Macaulay Minute on Indian Education 1835) drafted the Penal Code in 1837. Sedition was placed in the Penal Code 1837 as Section 113.
- British Raj in India had introduced this section on sedition under the title “Exciting Disaffection”.
- IPC Amendment Act of 1898: It made amendments to the changes brought through the Penal Code in 1870.
- The current Section 124A is said to be similar to the amendments made to it in 1898 with few omissions made in 1937, 1948, 1950, and by Part B States (Law) Act, 1951.

#### Arguments in support of Sedition law

- Section 124A of the IPC has its utility in combating anti-national, secessionist and terrorist elements.
- It protects the elected government from attempts to overthrow the government with violence and illegal means.
- The continued existence of the government established by law is an essential condition of the stability of the State.
- Many districts in different states face insurgency and rebel groups virtually run a parallel administration.
- These groups openly advocate the overthrow of the state government by revolution.
- Against this backdrop, the abolition of Section 124A would be ill-advised merely because it has been wrongly invoked in some highly publicized cases.

#### Arguments Against the Sedition Law

- The terms used under Section 124A like ‘disaffection’ are vague and subject to different interpretation
- As the seeds of sedition law were sown in colonial times, it is often described as a draconian law that can be used against what is otherwise is constitutionally guaranteed freedom of speech and expression
- Dissent and criticism of the government are essential ingredients of robust public debate in a vibrant democracy.
- Right to question, criticize and change rulers is very fundamental to the idea of democracy.
- It has an ill effect on constructive criticism. Therefore, sedition laws can demotivate legal and lawful criticism.
- To penalize the offender for disrupting public order, IPC and Unlawful Activities Prevention Act 2019 have provisions that can take care of the punishments.

#### Relevant Supreme Court judgements

##### The Kedar Nath Singh vs State of Bihar case (1962)

- The court ruled that comments-however strongly worded-expressing disapprobation of the actions of the government without causing public disorder by acts of violence would not be penal.

##### The Balwant Singh vs State of Punjab (1995) case

- In this case, the Supreme Court had clarified that merely shouting slogans does not amount to sedition. Evidently, the sedition law is being both misunderstood and misused to muzzle dissent.

### Way ahead

- It is time we define the limits of sedition. Provisions of 124A (sedition) and 153 (promoting enmity between classes) of the IPC require interpretation, particularly on the issue of the rights of press and free speech. India is the largest democracy of the world and the right to free speech and expression is an essential ingredient of democracy. The expression or thought that is not in consonance with the policy of the government of the day should not be considered as sedition. Section 124A should not be misused as a tool to curb free speech. The SC caveat, given in Kedar Nath case, on prosecution under the law can check its misuse.

## THE UNITED STATES OF INDIA

### Context

- In an important discussion in The Hindu, the scholars argued that what distinguishes the south from the north politically is its language of politics, its regional parties and their demand for more power to the States, its multiple languages and cultures, its countercultures built through various anti-caste, anti-Brahmin and rationalist movements, its higher economic status and its investment in education, modern institutions, industrial infrastructure, etc. while the north lagged in most of these aspects.

### Linguistic movements

- To understand that, we must look at the most important historical factor that distinguishes the two regions: the linguistic nationality movements, which imagined India as a federation of nationalities.
- While the north imagined India as a homogenous nation that resonates with the Hindi-Hindu-Hindustan slogan, the south aspired to build India as a federation of nationalities.
- The print and publishing culture led to the formation of distinct linguistic public spheres in the south, which were further consolidated by cinema.
- By the early 20th century, different linguistic communities in the south began to claim nationality status for themselves.
- The leaders were inspired by the political developments in Europe where, in the aftermath of major revolutions, new nations were founded based on linguistic identity with the political objective of achieving 'popular sovereignty.'
- Linguistic identity had proven to be secular, flexible and more inclusive than religious or racial identities, so the then Madras Presidency leaders consciously tried to cultivate it.
- The middle-class intelligentsia from the south recognised the crucial connection between language and liberal democracy.

### Language being not a barrier

- For a democracy to function, it is essential to employ the language of the common people in the domains of education, administration and judiciary, without which equality and justice cannot be realised.
- Also, to perform this new role, people's languages needed to be modernised adequately. However, all these, it was believed, would be possible only when India was created as a federation of nationalities.
- These languages would perish if India were forced into a single homogenous nation.
- Even a cursory look at the condition of the languages of the south today makes it clear that such fears are vindicated.

### The need for a strong bond

- India is not a nation but a subcontinent of multiple nationalities (similar to the European Union), and a unitary India would be unsuitable for democracy, which required the sovereign-citizens to participate in the decision-making processes of the nation-state actively.
- They argued that no single language could facilitate such a process for the entire subcontinent.

- Moreover, a strong nation needs strong bonding among its people. But the population of the Indian subcontinent spoke multiple languages, so no single language could bind them all as a national community.
- The idea that Hindi could keep India together, a fallacy that continues even today, emanates from the gross misunderstanding that it could bind people who do not speak it.
- We know that the French language could unite the people who spoke it. Or Tamil could unite the people who used it in their everyday life.
- However, to believe that Hindi could unite people from Kerala and Punjab or West Bengal who do not speak that language is to believe in the impossible.

### **Conclusion**

- After independence, the Congress made peace with the south through a compromise formula of agreeing to create linguistic States with limited powers granted by the Constitution.
- The right-wing Hindu groups vehemently opposed the idea of the federation and continue to do so as it would undermine their dream of creating a homogenous Hindu nation.
- In the end, while the Indian state has triumphed over the nationalities of the south, the ghosts of the latter continue to haunt the champions of the former, at least during elections.



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## GOVERNANCE

### SHRINKING SPACE FOR DISSENT

#### Introduction

- Public protests have long served as a catalyst for social and policy change in India, allowing individuals, classes and communities to voice their grievances and advocate for their rights. Over the past few years, protests have risen with bewildering rapidity. Protests had opened up space for a new era of social activism in the decade.

#### From Nirbhaya to the present

- In December 2012, people around the world watched as thousands took to the streets in the Central Vista of New Delhi following the brutal gang rape of a 23-year-old physiotherapy student (Nirbhaya). The protests became so intense and the public outrage was so great that the UPA government was compelled to address issues of sexual violence at the policy level, through the introduction of the new Criminal Law (Amendment) Act 2013 to bring stricter punishments and broaden the scope of offences.
- Fast forward to May 2023. Medal-winning wrestlers, who have brought honour to the country, have been on the streets for nearly four months to demand the arrest of the Wrestling Federation of India (WFI) chief who they have accused of sexually harassing women wrestlers and a minor. But the authorities did not respond for weeks. It took the Supreme Court of India's intervention for Delhi Police to file two first information reports (FIRs).

#### The protests

- Protests under the current regime are, no doubt, difficult as they are immediately branded as 'anti-national'.
- activists might feel the futility of protests against a government that does not listen; but the fact is that this regime has been forced to respond to some protests even if it has done so for reasons of political expediency.
- The withdrawal of the controversial farm laws and the back-tracking over the contentious National Register of Citizens (NRC) and the Citizenship (Amendment) Act (CAA) are two recent examples where the government had to back down.

#### The context of class politics

- Wrestling is deeply ingrained in Indian culture and has a long history, particularly in the rural areas.
- The protesting wrestlers mostly come from modest economic backgrounds; sports has helped them to achieve a measure of social and economic mobility.
- The active participation of the middle classes in the Anna Hazare Andolan (2011) and Nirbhaya protests presents a contrasting picture that highlights the importance given to social activism by this class.
- Their participation in the two movements catapulted them to the centre stage of the political discourse
- The urban middle class is also very well disposed to neo-liberalism; it has benefited from the opportunities available to it from the neo-liberal economy in the past three decades.
- Indeed, middle-class expansion has occurred since economic reforms through the private sector boom powered by economic liberalisation. This is the class that was enamoured by 'India Shining'.
- Their shifting political loyalties, however, reflect an ideological consistency that characterises the middle class in its combined devotion to neo-liberalism and Hindutva.
- The middle-class opposition to the UPA played a crucial role in discrediting it; now, these very classes strongly back the current dispensation and see no reason to go against it, even on issues of sexual violence.

#### Conclusion

- Middle-class activism tends to prioritise the issues and concerns that directly impact them, often overlooking the needs and struggles of the disadvantaged classes and communities. This self-focus can perpetuate inequalities and hinders efforts to address broader social issues. Failing to consider the intersections of class, caste, gender, and other factors can result in a narrow understanding of social reality and marginalised voices.



## INTERNATIONAL RELATIONS

### INDIA-NEPAL TIES

#### Context

- Despite daunting challenges to Nepal's democracy, governance and stability and seemingly intractable bilateral irritants, the Prime Ministers of Nepal and India have shown that a pragmatic approach and mutual sensitivity can re-energise bilateral relations.
- The Prime Minister of Nepal, Pushpa Kamal Dahal Prachanda's first bilateral visit to India since assuming office in the current term is notable in this sense. Driven by challenges presented by the post-COVID-19 world, current realities as well as huge opportunities, India and Nepal were able to review the entire spectrum of the bilateral agenda covering political, economic, trade, energy, security and developmental cooperation.

#### India-Nepal ties

- Nepal occupies a special significance in India's foreign policy because of the geographic, historical, cultural and economic linkages/ties that span centuries.
- India and Nepal share similar ties in terms of Hinduism and Buddhism with Buddha's birthplace Lumbini located in present day Nepal.
- The two countries have close bonds through marriages and familial ties, popularly known as Roti-Beti ka Rishta.
- The India-Nepal Treaty of Peace and Friendship of 1950 forms the bedrock of the special relations that exist between India and Nepal.

#### Areas of Cooperation Between the Two Countries

- Trade and Economy: India remains Nepal's largest trade partner, with bilateral trade crossing USD 7 billion in FY 2019-20.
- Connectivity: India is looking to develop the inland waterways for the movement of cargo, within the framework of trade and transit arrangements, providing additional access to sea for Nepal calling it linking Sagarmatha (Mt. Everest) with Sagar (Indian Ocean).
- Defence Cooperation: Bilateral defence cooperation includes assistance to the Nepalese Army in its modernisation through the provision of equipment and training. India from 2011, every year undertakes a joint military exercise with Nepal known as Surya Kiran.
- Humanitarian Assistance: Nepal lies in the sensitive ecological fragile zone which is prone to earthquakes and floods causing massive damage to both life and money, whereby it remains the biggest recipient of India's humanitarian assistance.
- Multilateral Partnership: India and Nepal share multiple multilateral forums such as BBIN (Bangladesh, Bhutan, India, and Nepal), BIMSTEC (Bay of Bengal Initiative for Multi Sectoral Technical and Economic Cooperation), Non-Aligned Movement, and SAARC (South Asian Association for Regional Cooperation) etc.

#### India-Nepal Projects

- Mahakali Treaty (6,480 MW)
- Upper Karnali Project (900 MW)
- Arun Three projects (900 MW)
- Seti River (SR6) project

#### Challenges

- Territorial Disputes: One of the main challenges in the Indo-Nepal ties is the Kalapani boundary issue. These boundaries had been fixed in 1816 by the British, and India inherited the areas over which the British had exercised territorial control in 1947.
- Issues with Peace and Friendship Treaty: The 1950 Treaty of Peace and Friendship was sought by the Nepali authorities in 1949 to continue the special links they had with British India and to provide them an open border and the right to work in India. But today, it is viewed as a sign of an unequal relationship, and an Indian imposition.

- **China's Intervention:** In recent years, Nepal has drifted away from India's influence, and China has gradually filled the space with investments, aid and loans.
- **Internal Security:** It is a major concern for India as the Indo-Nepal border is virtually open and lightly policed which is exploited by terrorist outfits and insurgent groups from North Eastern part of India e.g., supply of trained cadres, fake Indian currency.

### Way Forward

- The need today is to avoid rhetoric on territorial nationalism and lay the groundwork for quiet dialogue where both sides display sensitivity as they explore what is feasible. India needs to be a sensitive and generous partner for the neighbourhood first policy to take root.
- India should engage more proactively with Nepal in terms of people-to-people engagement, bureaucratic engagement as well as political interactions.

## FRICIONS IN INDIA-CANADA TIES

### Introduction

- Canada and India have long-standing bilateral relations built upon shared traditions of democracy, pluralism and strong interpersonal connections. The deep cultural and political ties between Canada and India are strengthened by a growing network of official dialogues, agreements, memoranda of understanding and working groups.

### India-Canada Bilateral Relations

- India established diplomatic relations with Canada in 1947.
- **Bilateral Mechanisms:** Both sides pursue bilateral relations through the dialogue mechanisms such as Ministerial level- Strategic, Trade and Energy dialogues; Foreign Office Consultations; and other sector specific joint working groups (JWG).
- **Commercial relations:** Both sides are engaged in technical negotiations for a Comprehensive Economic Partnership Agreement (CEPA) including trade in goods, services, investment, trade facilitation etc.
- **Major Items of Indian Exports are:** Medicines, Garments, diamonds, chemicals, gems and jewellery, petroleum oils, made-up, sea food, engineering goods, marble and granite, knitted garments, rice, electric equipment, plastic products, etc.
- **Major items of Canada's export to India are:** Pulses, fertilizers, newsprint, aircrafts & aviation equipment, diamonds, copper ores and concentrates, bituminous coal, wood pulp, nickel, unwrought aluminium, asbestos, God, cameras, lumber, ferrous waste, etc.
- **Nuclear Cooperation:** Indo-Canadian relations deteriorated in the wake of India's Smiling Buddha nuclear test of May 1974. However, in June 2010, a Nuclear Cooperation Agreement (NCA) with Canada was signed and came into force in September 2013.
- **Indo-Canadian Science and Technology cooperation:**
- Department of Biotechnology under IC-IMPACTS program implements joint research projects in health care, agri-biotech and waste management.
- The Department of Earth Science and Polar Canada has started a programme for the exchange of knowledge and scientific research on Cold Climate (Arctic) Studies.
- **Space:** ISRO and Canadian Space Agency (CSA) signed two MOUs in the field of exploration and utilisation of outer space in October 1996 and March 2003.
- ANTRIX, the Commercial arm of ISRO, has launched several nanosatellites from Canada.
- ISRO in its 100th Satellite PSLV launched on 12 January 2018, also flew the Canadian first LEO satellite, from the Indian spaceport Srihari Kota, Andhra Pradesh.
- **Security and Defence:** India and Canada collaborate closely in international fora, particularly through the UN, Commonwealth and G-20.
- **Agriculture:** The first meeting of the JWG set under this MoU was held in New Delhi in 2010, which led to the creation of three sub-groups on knowledge exchange in emerging technologies; animal development and agricultural marketing.

- **Education:** Education is a key area of mutual interest. Recently India became the top source of foreign students studying in Canada.
- **People-to-People ties:** Canada hosts one of the largest Indian diasporas in the world, numbering 1.6 million (PIOs and NRIs) which account for more than 4% of its total population.
- **Cultural Exchanges:** Canada was the Country of Focus at the 48th International Film Festival of India held in Goa in November 2017. There is also an India - Canada Coproduction Agreement in films.

#### Challenges

- **India's structural impediments:** India still has to overcome structural impediments such as complex labour laws, market protectionism, and bureaucratic regulations.
- **Inadequate trade:** While India-Canada economic relations have made some progress, Canada remains an insignificant trading partner for India.

#### Way ahead

- India-Canada relations have struggled to prosper, despite the two countries sharing various complementarities such as their democratic character and association in the Commonwealth. India must foster a deeper understanding of Canada and the potential it holds for India.

## LIGHTNING BLAMED FOR WILDFIRES

### Context

New York City's air quality was recently among the worst in the world due to smoke drifting from the wildfires in Canada.

### Cause of the wildfires

- According to a study published in Nature on February 10, 2023, lightning is the main precursor of natural wildfires. Laboratory experiments and field observations have together revealed that lightning electric currents that flow for more than some tens of milliseconds, the so-called long-continuing currents (LCC), are likely to produce fires.
- The study indicated an increase in the total global lightning activity and global LCCs by the 2090s.
- The same study also found that LCC lightning activity increased by around 47% over land, implying a higher risk of lightning-ignited wildfires in the future.

### Working of the lightning

- During a storm, water droplets in warmer air and ice crystals that condensed in cooler air coalesce together to form thunderstorm clouds (usually cumulonimbus clouds).
- Contact between these droplets and crystals produces a static electrical charge in the clouds.
- The negative and positive charges in the clouds build up. Over time, the voltage difference becomes high enough to surmount the resistance presented by the air, leading to a rapid discharge of electric charge. This is what we see as a lightning flash.
- It can occur between oppositely charged surfaces within a thunderstorm cloud or between such surfaces in the cloud and on the ground.

### Lightning as a climate indicator

- Long-term changes in lightning patterns reflect, at least in part, changes wrought by the climate crisis. The World Meteorological Organisation recognises lightning to be an essential climate variable that contributes critically to the way the earth's climate is characterised.
- This said, that It needs to be emphasised that lightning-climate relationship based on data for short periods, and different regions, in the present climate cannot always be used as a proxy for future global warming.
- According to a publication, lightning also produces nitrogen oxides, which react with oxygen in the air to form ozone, which is a strong greenhouse gas.

### Lightning strikes in India

- Of late, lightning strikes have been the deadliest natural disaster in India. There were 18.5 million lightning strikes in the country between April 2020 and March 2021 – 34% higher than the previous year – according to the Climate Resilient Observing Systems Promotion Council.

- Per a report of the Lightning Resilient India Campaign, 90,632 people died by lightning between 1972 and 2019. According to the National Crime Records Bureau, India had 2,875 deaths due to lightning in 2019, rising marginally by 2021.
- The private weather-forecasting company Skymet has reported that Odisha recorded the most strikes among India's states in 2019.
- It also said that most such deaths in India happen because people living in villages seek shelter from lightning under tall trees, which are more likely to be struck.

**Issues related to mitigation of lightning related casualties:**

- There is no national-level policy to tackle lightning fatalities except for providing a lump-sum ex-gratia to the kin of the deceased person.
- The Odisha government provides 4 lakh per deceased person to the next of kin from SDRF.
- Other State governments provide lump sum Ex-gratia to the deceased person's family.
- These policies are not adequate to minimise deaths due to lightning.

**Way Forward:**

- Inclusion of lightning as a natural disaster: The Centre should include lightning as a "natural disaster" to minimise lightning-related deaths.
- Hazard Mapping and targeted public interventions: In addition, some critical measures where public intervention is an absolute necessity include mapping vulnerable populations with potential lightning hotspots, improving early warning systems, and installing lightning detection systems in the local areas.
- Frequency database of lightning strikes: Moreover, the government should prepare a database related to the frequency of lightning strikes, gender-wise lightning deaths, and occupation-wise fatalities at the district, state and central levels for devising an action plan against lightning strikes.
- Training and community awareness programs: More than 70 percent of deaths from lightning occurred amongst people standing under tall trees; therefore, training and community awareness programs are essential measures to minimise deaths due to lightning.

**NEXT PHASE OF U.S.-INDIA DEFENCE TIES****Context**

- Over the last few years, there has been incredible momentum in U.S.-India ties, driven primarily by their defence relationship.

**Background**

- United States Secretary of Defence Lloyd Austin travelled to India from June 4-5 to reinforce the major defence partnership and advance cooperation in critical domains.
- Noticeably, his visit secured an agreement on a road map for defence industrial cooperation, announced as part of the U.S.-India initiative on Critical and Emerging Technology (Ice-T) agreement and which had its inaugural meeting in January this year.
- The road map envisages boosting defence manufacturing in India through greater technological cooperation.
- While the objectives complement India's own self-reliance mission and its desire to lessen import dependence, it potentially repositions the U.S. in the broader context of the U.S.-India strategic relationship.

**The objectives**

- The visit's objective had two important legs: technological innovation and growing military cooperation.
- One of the most important steps taken during the visit was towards strengthening the bilateral defence relationship by creating a road map to promote collaboration in the defence industry.
- The road map aims to expedite crucial co-development and co-production initiatives, fostering stronger connections between the defence sectors of the two countries.

**The initiatives**

- There was the launch of a new initiative, Indus-X, which is to provide a new impetus to the defence innovation engagement between the two countries.
- This builds on the U.S.-India bilateral Space Situational Awareness arrangement signed in 2022, which promises to enhance information-sharing and cooperation in the space sector.
- India's 'Major Defence Partner' (MDP) status along with the four foundational agreements signed with the U.S. now allow for the sharing of technology and more frequent cooperation.
- These have not only allowed the sharing of sensitive technologies without India having to become an ally but have also proved to be effective mechanisms to prevent backsliding due to procedural difficulties or structural differences.

#### **The Indo-US mandates**

- During the 2+2 Ministerial Dialogue in April 2022, the U.S. Defence Secretary referred to the U.S.-India defence partnership as the cornerstone of their engagement in the Indo-Pacific.
- He outlined broad aspects in the Indo-Pacific including coercive actions by the People's Republic of China; the aggressive actions of Russia towards Ukraine aimed at forcibly redrawing borders and undermining national sovereignty; transnational issues such as terrorism and climate change.
- Beyond the Indo-Pacific, a strong rationale for projecting broader industrial cooperation between Indian and U.S. companies in the defence sector is the existing scale of American investments in India.
- American companies led by Boeing, Lockheed Martin, BAE Systems, Honeywell Aerospace, Raytheon, Textron and others partner across a range of manufacturing activities related to the defence sector with Indian companies, most prominently with Hindustan Aeronautics Limited and the Tata group.
- These are likely to be supplemented by linking defence start-ups from both countries through an 'innovation bridge' that was announced in the iCET agreement.
- Recent steps promise to jump start the Defence Technology and Trade Initiative (DTTI) by providing specific momentum to co-production and co-development in the defence sector.

#### **Conclusion**

- The visit of the U.S. Defence Secretary has prepared the ground for the official state visit of Prime Minister Narendra Modi to the U.S. on June 22 which could see a few big-ticket announcements, especially in the area of defence cooperation. The sky, it seems, is the limit in the emerging defence partnership between two of the world's leading democracies.

## **REFUGEES AS ASSETS TO THEIR NEW COUNTRIES**

### **Context**

- As we commemorate yet another World Refugee Day (June 20), we honour the courage and resilience of the 103 million individuals who have endured forced displacement due to conflicts and unrest worldwide. These staggering figures mask countless human stories marked by loss and shattered dreams.

### **Importance of the day**

- This day is a reminder of our collective responsibility as global citizens and a call for engagement and empathy.
- It is a day to promote solidarity between communities, and, most importantly, to reflect on the importance of welcoming refugees and displaced persons into our communities.
- Global conflicts which include the ongoing wars in Ukraine, Myanmar and Sudan among others, and the protracted situations in Afghanistan, and Somalia present an unprecedented challenge.
- Sadly, South and Southeast Asia are not immune to the challenges of displacement. India is home to some 250,000 forcibly displaced persons, with women and children constituting half of that population.
- India continues to graciously host and assist refugees and asylum-seekers within its territory — a testament to our shared humanity.

### **Refugees want opportunities, not handouts**

- For refugee youth, it is not just a matter of talent; it is a matter of prospects.
- They want opportunities, not handouts.
- They wish to be self-reliant and are eager to use their talents and passions to contribute to the communities hosting them.

- We can all do more to give them hope and those opportunities while they are away from home.

### **Dismantling the barriers**

- Refugees and asylum seekers encounter a myriad of obstacles, such as legal recognition and challenges in obtaining government-issued documents, which hinder their access to essential services, including financial support and health care.
- It is incumbent upon us to dismantle these barriers and ensure that they are afforded equal opportunities in employment, education, housing, and health care.
- Our efforts in creating an inclusive society must cater to the unique needs of refugee youth.
- To ensure that truly no one is left behind, we should engage with and include youth, especially refugee youth, in the realisation of the Sustainable Development Agenda.
- Addressing the rising number of the forcibly displaced is an urgent moral imperative that demands our collective action.
- The Global Compact on Refugees acknowledges the magnitude of the displacement crisis and calls for solidarity through a whole of society approach.
- It is built on the understanding that the responsibility towards the forcibly displaced is not limited to governments but extends to each one of us including individuals, the private sector, non-government organisations and community-based organisations.
- It also recognises that the Global South is disproportionately affected and that host communities need assistance.

### **Conclusion**

- This is a critical moment in our lifetimes when we have the power to shape future generations. And we invite individuals, the private sector and governments to do their part in supporting youth from refugee and host communities. Together, we can truly ensure the Government of India's vision of 'Viksit Yuva Viksit Bharat' is realised.

## **PM MODI'S US CONGRESS ADDRESS: 'TOGETHER, WE SHALL DEMONSTRATE THAT DEMOCRACIES MATTER AND DEMOCRACIES DELIVER'**

### **Context**

- Recently Indian Prime minister Modi addressed the United States Congress on his official visit to USA. During the address, he highlighted certain areas of similarity and cooperation between both the nations.

### **Democracy is soul of both the nations**

- Democracy is one of sacred and shared values of both the nations. It has evolved over a long time, and taken various forms and systems.
- Throughout history, Democracy is the spirit that supports equality and dignity. It the idea that welcomes debate and discourse.
- Democracy is the culture that gives wings to thought and expression. India is blessed to have such values from times immemorial. Millennia ago, our oldest scriptures said, "the truth is one but the wise express it in different ways".
- The US is the oldest and India the largest democracy. Therefore partnership of both the nations is augurs well for the future of democracy.
- Together, Both the nations shall give a better future to the world, and a better world to the future.

### **India represents Unity in diversity: A message to the world for peaceful coexistence**

- Last year, India celebrated 75 years of its independence. I was a remarkable journey of over 75 years of freedom, after a thousand years of foreign rule in one form or another.
- This was not just a celebration of democracy, but also of diversity. Not just of the Constitution, but also of its spirit of social empowerment. Not just of our competitive and cooperative federalism, but also of our essential unity and integrity.
- India has over 2,500 political parties and about 20 different parties govern various states of India that shows political diversity and its recognition.

- We have 22 official languages and thousands of dialects, and yet, we speak in one voice. Every hundred miles, our cuisine changes.
- India is home to all faiths in the world and celebrates all of them. Therefore, diversity is a natural way of life.

**Women role in India's progress and development from historical to modern scenario:**

- Women sages composed many verses in the Vedas. And today, women are leading us to a better future.
- India's vision is not just of development which benefits women. It is of women-led development.
- A woman has risen from a humble tribal background, to be our head of state. Nearly 1.5 million elected women lead us at various levels.
- Today, women serve our country in the Army, Navy and Air Force. India also has the highest percentage of women airline pilots in the world. I believe that investing in a girl child lifts up the entire family. Empowering women transforms the nation.
- India is known for its traditions. But the younger generation is also making it a hub of technology. In India, technology is not only about innovation but also about inclusion.
- Today, digital platforms are empowering the rights and dignity of people, while protecting privacy. Last year, out of every 100 real-time digital payments in the world, 46 happened in India.

**India's vision for fight against climate change: A message to World**

- India became the only G20 country to meet its Paris commitment.
- At the Glasgow Summit, India proposed Mission LiFE — Lifestyle for Environment.
- This is a way to make sustainability a true people's movement. The same spirit is also seen in the theme when we chair the G20 — "One Earth, One Family, One Future".

**India and USA relation: Multiple areas of cooperation**

- US occupies a special place in the vision of India's approach to the world.
- As When defence and aerospace in India grow, industries in the states of Washington, Arizona, Georgia, Alabama, South Carolina, and Pennsylvania thrive. When American companies grow, their research and development centres in India thrive.
- When India and the US work together on semi-conductors and critical minerals, it helps the world in making supply chains more diverse, resilient and reliable. Indeed, we were strangers in defence cooperation at the turn of the century. Now, the US has become one of our most important defence partners.
- Cooperation in the critical technology:
- One consequence of globalisation has been the over-concentration of supply chains. Both the nations have work together to diversify, decentralise, and democratise supply chains.
- Technology will determine security, prosperity and leadership in the 21st century and both countries established a new initiative for Critical and Emerging Technologies.
- It will serve humanity and seek solutions to the global challenges of climate change, hunger and health.

**India's message to World: Today is not era of war**

- With the Ukraine conflict, war has returned to Europe. Since it involves major powers, the outcomes are severe. Countries of the Global South have been particularly affected.
- India has highlighted that, this is not an era of war. But it is one of dialogue and diplomacy. And, we all must do what we can to stop the bloodshed and human suffering.

**India's vision for free, open and inclusive Indo-Pacific:**

- AS the dark clouds of coercion and confrontation are casting their shadow in the Indo-Pacific. The stability of the region has become one of the central concerns of India-US partnership.
- Both the nations share a vision of a free, open and inclusive Indo-Pacific, connected by secure seas, defined by international law, free from domination, and anchored in ASEAN centrality.
- A region where all nations, small and large, are free and fearless in their choices, where progress is not suffocated by impossible burdens of debt, where connectivity is not leveraged for strategic purposes
- For this purpose, India and USA work through regional institutions and with our partners from within the region and beyond. Of this, the Quad has emerged as a major force of good for the region.

### Reforms that need to be made

- As the world emerges out of the pandemic, we must give shape to a new world order. Consideration, care and concern are the need of the hour. Giving a voice to the Global South is the way forward. That is why African Union should be given full membership of G20.
- There is need to revive multilateralism and reform multilateral institutions, with better resources and representation. That applies to all our global institutions of governance, especially the UN. When the world has changed, our institutions too must change.

### Conclusion

- Today, India-USA stand at a new dawn of relationship that will not only shape the destiny of two nations, but also that of the world. And together both the nations demonstrate that democracies matter and democracies deliver.

## TECH IS THE NEW DRIVER OF INDIA-US DIPLOMACY

### Context

- Recently, India-US bilateral relations reach to new height with the incredibly ambitious agenda for technology cooperation, ranging from artificial intelligence to outer space and quantum computing to telecommunications.

### About the recent visit of Indian Prime minister to USA that provides new insight

- In a joint statement issued after the talks at the White House, the two leaders committed their governments to “facilitate greater technology sharing, co-development, and co-production opportunities between U.S. and Indian industry, government, and academic institutions.”
- They also directed the two bureaucracies to make “regular efforts to address export controls” and “enhance high technology commerce” between the two nations.

### Historical past of technological relation of both countries

- There was a brief flowering of India-US technology cooperation. US assisted India’s nuclear and space programmes in the 1950s and 1960s.
- India’s first nuclear power plant at Tarapur was built by General Electric and its first satellite by Ford Aerospace. The US also contributed to India’s Green Revolution.
- But As anti-Americanism gripped the Indian political class from the late 1960s, there was a deliberate attempt to snuff out academic and research links to the United States
- The US on its part, began to actively restrict technology cooperation with India as America’s post-war scientific internationalism was replaced by the non-proliferation theology.
- Although Indira and Rajiv Gandhi sought to restore India-US technology cooperation in the Cold War, it was hard to get going.
- Later It was the historic civil nuclear initiative unveiled by George W Bush and Manmohan Singh that broke through the paradigm of non-proliferation

### Technology sharing is vital link of both nation

- To be sure, technology formed a running theme in the evolution of India-US ties since Independence. But it was a boutique element.
- At the best of times, technology cooperation showcased the Indian elite’s ambitions at the highest level however in bad times, it became a bone of political contention.
- As, India is eager to rescue Indian science and technology from excessive statism and bring the industry, especially the private sector, and the innovation communities into play.
- And US has sought to cut through a welter of regulations limiting US technology cooperation with India. If their plans unfold according to ambition, one will see the technology interface between the two countries rapidly broaden and thicken.
- As new productive forces unleashed by new technologies create possibilities to reboot the Indian and American economies, enhance their national security, and rearrange the global economic order.



- Therefore, India-US technological cooperation also opens the door for addressing global challenges such as climate change.

### **Conclusion**

- This significant technology bridge which has been empowered by the Modi-Biden plan, is all set to play a crucial role in reshaping the relations between the two countries.

## **US AND INDIA: OLD FRIENDS IN A CHANGING WORLD**

### **Context**

- Recently India Prime minister had official visit to USA and during the visit new pacts were signed that shows the strengthen relation between both the countries.
- As, Prime Minister Narendra Modi addressed the US Congress a second time, and talking to the Indian diaspora represent that US-India relations are deepening and widening.

### **Factors which shape the relations of both the nations**

- China factor: China factor may be the most important one for the current affability.
- China's meteoric rise on the economic front over the last four and half decades, with accompanying military power, is being seen as a threat to global security by many nations.
- And the QUAD comprising Australia, Japan, India, and the US is one such forum for the process. The current US-India friendship is only an extension of that at a bilateral level.
- This makes one thing clear: As nations become rich, they need to be responsible towards global peace and welfare.
- The growing economy of India:
- There is no doubt that the US has been a superpower both in economic terms as well as in its military might for quite some time.
- As per the International Monetary Fund (IMF), the US economy in April 2023 stood at \$26.6 trillion with a per capita GDP of \$80,000 at current prices. In comparison to that, India is way behind with an overall GDP of \$3.74 trillion and a per capita GDP of just \$2,600
- In PPP terms, however, India's GDP improved to \$13 trillion and its per capita GDP to about \$9,000.
- Thus, the dollar-to-PPP conversion factor is roughly 3.5, which in simple terms means that a dollar in India can buy roughly 3.5 times more goods and services than in the US.
- Therefore, the difference between the US and Indian economies and the welfare of their people narrows when we look at these indicators in PPP terms rather than current US dollars.

### **A healthy trilateral relation is good for world peace and prosperity**

- For world peace and prosperity, it would be best if the three countries can work together. But the foundation of any friendship and working together is trust, which requires transparency in behaviour and actions as per the agreed rules of the game.
- And it is here that the political system of democracy wins over authoritarian regimes. Not that democracy is without its flaws, be it in the US or India, but it is certainly better than military or authoritarian regimes.

### **Balancing the relation between Russia and USA**

- After the Ukraine-Russia conflict, global powers are realigning into new groupings.
- India has a tough task of walking a very tightrope between Russia and the US. One can only hope that Prime Minister Modi can calibrate this balancing act and bring dialogue and diplomacy to resolve strong differences, and not be part of the ever-widening chasm which can be suicidal to the existence of humanity on this planet.

### **India-US has wide areas of cooperation**

- Both the nations have cooperation in defence, space and high-tech chip-making may just be the beginning. The potential in many other sectors is enormous.
- India's pitch for inclusive and sustainable growth has to be seen in that context. As India's voice for the growth that has to be pro-people and pro-planet is clear and commendable. Therefore, it includes the African Union in the G-20 grouping.
- In defence and technology

- Recently, India and US signed \$3 billion deal for 31 High Altitude Long Endurance (HALE) UAVs
- Another major announcement that came was an MoU signed between GE and Hindustan Aeronautics Limited (HAL) to jointly produce fighter jet engines for the Indian Air Force.
- Climate change and food security:
- Along with it, for the eight billion people on this planet, food and nutritional security is of equal importance, if not more. This is being threatened by climate change with increasing temperatures.
- India is given its large population of 1.4 billion. The US is at the forefront of technologies not just in defence, space, and semiconductors but also in agriculture.
- One may recall that in the 1960s when India was struggling to feed its fast-growing population, several state agricultural universities were opened with the support and mentoring of their counterparts in the US.
- These universities were instrumental in shaping India's Green Revolution, although the initial seeds of high-yielding varieties of wheat and rice came from outside
- Both the nations can further rejuvenate agricultural universities with cutting-edge technologies and policies to cope with climate change and produce more nutritious food with less land, less water, and less GHG emissions

#### **Way forward**

- US-India collaboration, there will be a special attempt to include food and agriculture as one of the core areas of cooperation. It has the potential to do good to the maximum number of people in the developing world, be it in Asia or Africa.
- Therefore, India-USA stand at a new dawn of relationship that will not only shape the destiny of two nations but also that of the world.

CivilsTap Hlmachal

## SOCIAL ISSUES, EDUCATION, HEALTH

### HOW LONG-TERM STRESS IMPACTS THE INTESTINE AND YOUR LIFE

#### Context

- The crossroads of mental health and gastroenterology got a lot more attention in May this year, with a study published in Cell journal, titled 'The enteric nervous system relays psychological stress to intestinal inflammation'.

#### The study

- Mental health profoundly impacts inflammatory responses in the body. This is particularly apparent in inflammatory bowel disease (IBD), in which psychological stress is associated with exacerbated disease flares.
- It's an important study as for the first time we have a much clearer understanding of the possible underlying mechanisms of inflammatory response and the whole cascade which ultimately precipitates the disorder.
- This is good not only for researchers but also for clinicians, because the pathways have been quite well explained.

#### Stress fracture

- The study talks of stress pushing the adrenal gland to make glucocorticoids, a steroidal stress hormone.
- When stress is short-term, like before an exam, it may result in a loss of appetite and increased frequency of stools.
- When it's chronic, or experienced long term, over a few weeks to months to years, like in a toxic job or marriage or through childhood with the pressure to perform, it can result in inflammation of the gastrointestinal tract, an example being inflammatory bowel disease (IBD).
- With chronic stress, the body is constantly producing glucocorticoids. Two mechanisms may kick in, : “
- One is mediated by monocytes (white blood cells in the immune system that kill invaders) and TNF (tumour necrosis factor, a protein made by white blood cells), both mediators of inflammation through colony stimulating factor-1 (CSF-1, signalling pathways),” . This results in physical changes to the intestine – damage to the intestinal mucous membrane due to the inflammation.
- “The second is associated with neurotransmitter acetylcholine deficiency and dysmotility (abnormal speed of intestinal movement due to improper functioning of the muscles in the area). This is mediated through another inflammatory mediator: transforming growth factor (TGF) beta 2,” . This is the functional change in the gut.

#### Two disorders

- IBD is quite different from irritable bowel syndrome (IBS) that is also precipitated by stress, and seen a great deal in women. Unlike IBD though, IBS does not cause, and neither is it caused by an inflammatory response.
- IBD is caused by multiple factors, one of which is stress.
- IBD is immunologically mediated (relating to the immune system) and can be hereditary.
- Ulcerative colitis and Crohn's disease are two examples of IBD and bear the risk of colorectal cancer, while IBS is a part of a larger clutch of disorders of the gut-brain interaction (DGBI).

#### Dual brains

- What the study also does is to draw attention back to the way stress impacts the body, particularly the GI system.
- There are two brains: the big brain and the small brain (nerves in the intestine).
- The gut-brain axis is controlled by the parasympathetic nervous system (the vagus nerve that regulates internal organ functions like digestion), and the sympathetic nervous system located across the body.
- Both are connected with the enteric nervous system located in the gastrointestinal system (the small brain).
- The two brains 'talk' to each other (exchange information), hence stress occurring in the big brain can cause changes in the small brain (butterflies in the stomach before an exam).
- Physiologically, stress affects the hypothalamus-pituitary-adrenal (HPA) axis, activates the sympathetic nervous system, releases inflammatory cytokines and cortisol. This has an impact on both IBS and IBD.

**Way forward**

- We cannot eliminate stress; we can only evolve mechanisms of coping better with stress. Aerobic exercise and yoga play a big role in dissipating stress.
- Aerobic exercises release endorphins which not only boost mood, but also helps in coping better with pain. A regular yoga practice boosts brain-derived neurotrophic factor (BDNF) levels, important in learning and memory. Yoga also induces a relaxation response.

**PRIORITISE THE HEALTH AND NUTRITION OF ADOLESCENT GIRLS.****Context**

- To unlock the full potential of India's future, we have to prioritise the health and nutrition of its adolescent girls.

**Adolescence**

- It is a pivotal period of cognitive development and, therefore, improving access to nutrition during this "second window of opportunity of growth" compensates for any nutrient deficiencies acquired during early developmental stages in the girl child.
- Furthermore, adolescent health is a significant indicator of women's labour force participation in India in the long term, as better nutrition improves every young girl's prospect to participate in productive activities.
- Thus, the country beholds a colossal opportunity to add to its nation's demographic dividend by investing in nutrition interventions in adolescent girls.

**Ever-growing nutritional concern**

- Adolescent girls are particularly vulnerable to undernutrition and anaemia due to the onset of menstruation. The findings of the National Family Health Survey-5 (2019-21) confirm these concerns, as a staggering 59.1% of adolescent girls were found to be anaemic.
- There has been reports that 41.9% of school-going girls as underweight, the numbers showcase a worrying trend.
- What makes the situation more complex is the fact that a range of factors, from environmental conditions to cultural norms that lack a gender-neutral environment within a household, affects the nutrition uptake in adolescent girls.

**Concerns**

- Poorly balanced and insufficient diets can lead to cognitive impairments that affect one's academic performance. This can result in lower educational attainment, which can limit opportunities for employment and economic self-sufficiency later in life.
- Undernourished adolescent girls are also at a higher risk of chronic diseases and pregnancy complications, which can lead to a higher health-care burden on both families and communities, potentially leading to financial instability and increased poverty.
- If our girls are less healthy and less educated, they are less likely to participate fully in society, whether through work, politics, or community involvement.

**Redefine the interventions**

- Therefore, it is imperative that we redefine interventions such that we not only centre it around good nutrition but also adopt a life-cycle approach, ensuring that no girl gets left behind. Additionally, a few strategic modifications to existing interventions can significantly expand the scope of its outcomes.
- The convergence of various government initiatives such as the Scheme for Adolescent Girls (SAG) within the umbrella of the Prime Minister's Overarching Scheme for Holistic Nutrition programme (POSHAN) 2.0 is a step in the right direction, provided it is implemented effectively.
- Targeted adolescent-oriented schemes such as the Rashtriya Kishor Swasthya Karyakram (RKSK) could include even stronger awareness and nutrition education programmes that would help sustain beneficiary compliance.
- Targeted and regionally contextualised Social and Behaviour Change Communication (SBCC) efforts around adolescent girls' nutrition are sure to generate greater demand and the adoption of good practices.

- For improved outcomes, it is very imperative for effective convergence and collaborations among all the relevant departments, in a way that fosters a collective endeavour.
- Routine training of health workers for effective implementation and monitoring of various schemes, and to adapt with an evolving landscape, is also a crucial step in this process.

### Conclusion

- We have an enormous responsibility, as well as a tremendous opportunity, to ensure the welfare and the upliftment of the nation by prioritising the nutritional needs of India's girls. The strength of a nation is measured by its ability to nurture its future generations; hence, let us work collectively to sow the seeds of a healthier, stronger India, where every girl can reach her full potential.

## NON-COMMUNICABLE DISEASES (NCD) PLAGUE KERALITES' HEALTH

### Context

- For a State which takes immense pride in consistently coming at the top in the health index rankings of NITI Aayog every year, the findings of the ICMR-INDIAB study, which puts Kerala right on top with the worst overall indicators for long-term morbidity and mortality due to non-communicable diseases (NCD), has come a cropper.

### Non-communicable diseases (NCD)

- Noncommunicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioural factors.
- The main types of NCD are cardiovascular diseases (such as heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes.
- Causes are Tobacco use, unhealthy diet, harmful use of alcohol, physical inactivity and air pollution are the main risk factors contributing to these conditions.
- According to WHO, over 60.46 lakh people died due to NCDs in India in 2019.

### Kerala's case study

- Kerala has known since the mid or late 90s that NCDs are going to be its biggest health challenge.
- A current diabetes prevalence of nearly 24%, pre-diabetes at 18.1% and hypertension prevalence at a whopping 44%, is certainly not the picture of a healthy State.
- With more than half the State's population having high cholesterol levels and abdominal obesity, the incidence of cardiovascular diseases and chronic kidney diseases could skyrocket in the near future and have significant impact on the State's health expenditure as well as private spending on catastrophic illnesses.
- Experts point out that the high incidence of chronic kidney disease in the State is a direct consequence of the spiraling levels of hypertension, which again is a result of poor adherence to the drug protocol, apart from factors like unhealthy diet and sedentary lifestyle.

### Suggestions

- Diabetes management requires the patient to have fair awareness on what makes the blood sugar spike. Limiting carbohydrates, improving nutrition through the increased consumption of vegetables and fruits and daily physical activity are important lifestyle interventions that patients need to imbibe.
- Patients also have to be given affordable choices when it comes to diet and medication advice. Adherence to medication has to be ensured through consistent follow-up and people have to be motivated continuously to ensure that the changes they embrace become a part of their lifestyle.
- Health workers or ASHAs in the field need to be trained better to impart awareness at the grassroots, to follow-up patients rigorously; they should be offered attractive incentives for the same.

### Indian initiatives for tackling NCDs

- National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) is being implemented under the National Health Mission (NHM).

- The Central Government is implementing the Strengthening of Tertiary Care Cancer facilities scheme to support the setting up of State Cancer Institutes (SCI) and Tertiary Care Centres (TCCC) in different parts of the country.
- Oncology in its various aspects has a focus in case of new AIIMS and many upgraded institutions under Pradhan Mantri Swasthya Suraksha Yojana (PMSSY).
- Affordable Medicines and Reliable Implants for Treatment (AMRIT) Deendayal outlets have been opened at 159 Institutions/Hospitals with an objective to make available Cancer and Cardiovascular Diseases drugs and implants at discounted prices to the patients.
- Jan Aushadhi stores are set up by the Department of Pharmaceuticals to provide generic medicines at affordable prices.

#### **Way forward**

- Identifying the scope of the problem and documenting it is the easy part. But stepping in with effective interventions to increase public awareness about NCDs and its long-term consequences and-improving primary prevention of diabetes and hypertension through the promotion of a healthy lifestyle is where most health systems falter.

#### **Conclusion**

- The problem is not unique to Kerala. It is a huge challenge to health systems-to create, implement and sustain programmes for the promotion of healthy lifestyles because it is not easy to change people's attitudes towards self care, their long-term food habits or to inculcate new habits like daily exercise.

### **MALE-CENTRIC MEDICINE AFFECTING WOMEN'S HEALTH**

#### **Introduction**

- Exactly three decades ago, the U.S. National Institutes of Health (NIH) Revitalization Act of 1993 mandated the inclusion of "women and minorities" in clinical trials in a bid to reduce health disparities. Yet, to date, the male model of medicine is thriving, and so is the tendency of treating women as smaller men despite a growing body of research insisting on physiological differences (beyond the reproductive organs) between the sexes. The genetic and epigenetic differences between men and women are also extensively documented.

#### **Generic drugs, trials, mental health**

- In India, the "pharmacy of the world", the gender disparity in clinical trials has even bigger implications, thanks to generic drug production and consumption.
- It has been demonstrated in various studies that women's bodies respond differently to the components of generic drugs.
- It was clear in clinical trials that nearly one-fifth of medications showed a difference in the active dose between men and women.
- It is not just about treatment but also testing and diagnosis where women have been getting a rough deal.
- The study firmly notes that depression rates and the prevalence of anxiety are higher for women than for men worldwide in general.
- Like depression, cardiac issues are now acknowledged as having a slightly more prevalence in women. Yet, they continue to be diagnosed and treated like 'lesser men'.
- Study after study demonstrates that women are less likely to receive appropriate medications, diagnostic tests and clinical procedures even in developed countries such as Canada and Sweden.
- The stereotype of the "hysterical woman" continues to haunt women even when they need urgent clinical interventions.

#### **Gaps that can be linked to apathy**

- The exclusion of women from clinical trials and research projects addressing sex-agnostic critical illnesses such as cancer and heart disease has resulted in a limited understanding of sex-specific symptoms and responses to treatment.

- When it comes to sex-specific illnesses such as breast or endometrial cancers, polycystic ovarian syndrome, and pregnancy-related issues, there are serious gaps in research that can only be explained by an apathy towards “women’s only” issues.
- United States-based studies show that the funding received for research in migraine, endometriosis and anxiety disorders is much lower in proportion to the burden of these illnesses.
- World Health Organization data from 2017 show that “every day about 808 women die due to complications of pregnancy and childbirth”.
- Pregnant women are further down the ladder of representation in clinical trials and research.

#### **Government Initiative to Ensure Health Facilities to Women**

- Health and Wellness Centres: India has about 76,000 health and wellness centres which perform screening of 5 types of health issues; hypertension, diabetes, breast cancer, oral cancer and cervical cancer.
- Adolescent Friendly Health Services Program: Rastriya Kishor Swasthya Karyakram is there where female adolescents are sensitised about their health. The programme also focuses on reaching out all adolescents including Lesbian, Gay, Bisexual, Transgender and Queer (LGBTQ).
- Auxiliary Nurse Midwife: Auxiliary Nurse Midwife, commonly known as ANM, is a village-level female health worker in India who is known as the first contact person between the community and the health services.
- Janani Suraksha Yojana (JSY): Janani Suraksha Yojana (JSY) is a safe motherhood intervention under the National Health Mission (NHM). JSY is a 100% centrally sponsored scheme and it integrates cash assistance with delivery and post-delivery care.
- Pradhan Mantri Matru Vandana Yojana (PMMVY): PMMVY is a scheme for pregnant women and lactating mothers. Is a direct benefit transfer (DBT) scheme under which cash benefits are provided to pregnant women in their bank account directly to meet enhanced nutritional needs and partially compensate for wage loss.

#### **Way forward**

- In an equitable world, women would be accepted as an individual category, with race, age and class as subcategories. And an equal amount of time and resources would be spent in finding and providing treatment and health care.
- India’s G-20 presidency may be an opportune time to highlight this issue in alignment with Sustainable Development Goals on women’s health.

## **RANKING SYSTEM OF COLLEGES**

### **Introduction**

- In a country as diverse as India, ranking universities and institutions is not an easy task. The Ministry of Education established the National Institutional Ranking Framework (NIRF) in 2016 to determine the critical indicators in which institutions’ performance could be measured. Since then, institutions nationwide, including universities and colleges, eagerly await their standings in this nationally recognised system every year.

### **Ranking by NIRF**

- NIRF ranks institutes by their total score and it uses five indicators to determine this score — ‘Teaching, Learning & Resources’ (30% weightage); ‘Research and Professional Practice’ (30%); ‘Graduation Outcomes’ (20%); ‘Outreach and Inclusivity’ (10%); and ‘Perception’ (10%).
- Academic communities have had concerns about the construction of these indicators, the transparency of the methods used, and the overall framework.
- An important part of it is focused on the research and professional practices part of the evaluation because they pay a lot of attention to bibliometric measures.
- Currently, the NIRF releases rankings across various categories: ‘Overall’, ‘Research Institutions’, ‘Universities’, and ‘Colleges’, and specific disciplines like engineering, management, pharmacy, law, etc.
- The rankings are an important resource for prospective students navigating the labyrinth of higher education institutions in India.

### **Bibliometrics**

- Bibliometrics refers to the measurable aspects of research, such as the number of papers published, the number of times they are cited, and the impact factors of journals.
- The allure of bibliometrics as a tool for assessing research output lies in its efficiency and convenience compared to qualitative assessments performed by subject experts, which are more resource-intensive and require time.
- However, science policy experts have cautioned authorities against relying too much on bibliometrics as a complete assessment.
- They argued that bibliometric indicators don't fully capture the intricacies of scientific performance, and that we need a more comprehensive evaluation methodology.

### **Issue with overly relying on bibliometrics**

- This criticism has been levelled against the NIRF vis-a-vis the efficacy and fairness of its approach to ranking universities.
- For example, the NIRF uses commercial databases, such as 'Scopus' and 'Web of Science', to get bibliometric data. But these entities aren't impervious to inaccuracies or misuse.
- The NIRF's publication-metrics indicator solely considers research articles, sidelining other forms of intellectual contributions, such as books, book chapters, monographs, non-traditional outputs like popular articles, workshop reports, and other forms of grey literature.
- As a result, the NIRF passively encourages researchers to focus on work that is likelier to be published in journals, especially international journals, at the cost of work that the NIRF isn't likely to pay attention to.
- This in turn disprivileges work that focuses on national and local issues, as international journals prefer work on topics of global significance.

### **Transparency of NIRF**

- University rankings are controversial. NIRF, the Times Higher Education World University Rankings, and the QS World University Rankings all have flaws.
- Experts have emphasised that they ought to be transparent about the data they collect, the sources and how they collect it, and how that data becomes the basis for the total score.
- The NIRF is partly transparent as it publicly shares its methodology, but it doesn't provide a detailed view.
- The framework for assessment and scoring are based on bibliometric data. However, there is a potential discrepancy in how they label research quantity and quality. The labels in question are imprecise and potentially misleading.

### **Conclusion**

- No matter how rigorous the methods, university rankings invariably involve some level of ambiguity. The NIRF's emphasis on rankings can lead to unhealthy competition between universities, fostering a culture that puts metrics in front of the thing they are trying to measure: excellence in education and research

## **ANXIETY DISORDERS AND ITS TREATMENT: THE STIGMA REMAINS**

### **Context**

- Anxiety disorders are among the most frequently occurring mental health problems in the community today. They often go unrecognised in primary care settings due to lack of awareness and available human resources.

### **Introduction**

- Anxiety, as an emotion, is experienced by many in day-to-day life. In some, it can become persistent and disabling.
- Fear is an emotional response to perceived imminent threat or danger associated with urges to flee or fight.
- This 'fight-or-flight response' is characterised by a startled response and physiological changes.



- In contrast, anxiety is the apprehensive anticipation of future danger or misfortune accompanied by a feeling of worry, distress, and/or bodily symptoms of tension.

### **Historical context**

- Until the last part of the 19th century, anxiety disorders were not classified separately from other mood disorders, such as depression.
- In 1895, Sigmund Freud first suggested that people with mainly anxiety symptoms should be differentiated from depression. He gave the name “anxiety neurosis” to this entity.
- Freud’s original anxiety neurosis included people with phobias and panic attacks. He subsequently divided them into two groups – anxiety neurosis and anxiety hysteria.
- The first group included people with mainly psychological symptoms of anxiety, while the second group had people with phobias and physical symptoms of anxiety.

### **Prevalence and onset of anxiety**

- India’s National Mental Health Survey (NMHS) of 2015-2016 found the prevalence of neurosis and stress-related disorders to be 3.5%.
- These disorders were twice as common in women as compared to men.
- There is evidence that the developmental period of childhood, adolescence, and early adulthood are periods of high risk for the onset of anxiety disorders.

### **Clinical features of anxiety**

- Generalised anxiety disorder (GAD) is characterised by excessive worrying (which lasts more than six months) and is not restricted to particular circumstances — for example, only when attending a social event.
- Common features include apprehension, tension, difficulty concentrating, and autonomic symptoms such as dry mouth or abdominal discomfort.
- Panic disorder is characterised by recurrent unexpected surges of severe anxiety (also known as panic attacks), which typically peak within 10 minutes and last around 30-45 minutes.
- They are characterised by a sudden onset of palpitations, choking sensation, chest pain, dizziness, depersonalisation (patients feel that they have changed and feel divorced from their own self), derealisation (patients feel that the world has become unreal, distorted or falsified), and fear of dying or losing control.
- Social anxiety disorder is characterised by the intense, persistent fear of being scrutinised or evaluated negatively by others.
- Patients anticipate ridicule or humiliation, and avoid many social situations or endure them with great distress.
- Shyness is a core symptom of social phobia
- Separation anxiety disorder is characterised by fear or anxiety concerning separation from those to whom an individual is attached.
- Common features include excessive distress when experiencing or anticipating separation from home, and persistent excessive worries about potential harms to attachment figures or untoward events that might result in separation.
- Specific (simple) phobia is characterised by the fear of particular objects, animals or situations. Common specific phobias include fears of animals, blood, injection, flying, heights, lifts, enclosed spaces, dental treatment, and choking.

### **Treating anxiety**

- The need for treatment is determined by ascertaining the severity and persistence of symptoms, their impact on everyday life, the co-occurrence of depressive symptoms, and previous response to medication or psychotherapy.
- The choice of treatment is influenced by clinical characteristics, patient and doctor preferences, and the local availability of potential interventions.

- There is much overlap across anxiety disorders for evidence-based effective therapies, such as the prescription of a selective serotonin re uptake inhibitor (SSRI) or a course of cognitive behavioural therapy (CBT), but there are differences in treatment response between disorders.

### **Conclusion**

- Anxiety disorders are among the most frequently occurring mental health problems in the community today. They often go unrecognised in primary care settings due to stigma, lack of awareness, and lack of locally available human resources. Therefore it is vital to increase public awareness of anxiety disorders and the fact that they are treatable with effective interventions.

## **RETHINKING IMPORTANCE OF CORD BLOOD IN REGENERATIVE MEDICINE**

### **Context**

- Cord blood banking is not a 'biological insurance' and its role in regenerative medicine is hypothetical. It is recommended only if there is a family member (siblings or biological parents only), currently suffering from diseases approved to be benefitted by allogenic stem cell transplantation.

### **Cord Blood**

- The blood from the newborn that is still present in the placenta and umbilical cord after birth is known as cord blood.
- Umbilical cord blood is a rich source of stem cells; i.e., Hematopoietic stem cells, which are unique cells and can be employed to cure certain disorders.
- In the body, hematopoietic stem cells can develop into many types of blood cells.
- Worldwide, cord blood banking is advised as a source of hematopoietic stem cells for transplantation for haematological malignancies and illnesses where its usage is advised (derived from bone marrow, peripheral blood, or umbilical cord blood).

### **Cord Blood Banking**

- A System that preserves umbilical cord blood for use in the future is known as a Cord Blood Bank.
- Private and public cord blood banks have emerged in response to the prospect of using cord blood to treat immunological and blood-related illnesses.
- Public cord blood banks operate similarly to public blood banks in that they accept donations to be utilised for anybody in need. Historically, the medical establishment has been more open to the idea of public cord blood banking. Private cord blood banks only keep cord blood for the donor or the donor's family to potentially use.
- However, the Indian Council of Medical Research (ICMR) asserts that there is no scientific support for cord blood storage for future self-use, posing moral and social concerns.
- The ICMR does not advocate using stem cells for commercial purposes and Commercial cord blood banking also.

### **Collection and Cryopreservation of Cord Blood**

- After the umbilical cord has been severed, cord blood is collected from the foetal end of the cord.
- The placenta may be used to obtain more stem cells. The placenta is transported to the stem cell lab, where it is processed for extra stem cells after the healthcare professional takes cord blood from the placental end of the umbilical cord. In order to guarantee that there will be enough cells for a transplant, sufficient cord blood collection requires at least 75mL.
- Before the cord blood is kept for future use, it is tested for viruses, such as HIV and Hepatitis B and C, and tissue typing is done to ascertain the kind of human leukocyte antigen.
- Additionally, it will be checked for bacterial and fungal growth as well as nucleated cell count, cell viability, blood group antigen ABO & Rh blood group system, molecular cluster, and blood group antigen.
- The cord blood unit is collected, sent to the lab for processing, and then frozen.
- For the cord blood to survive the cryogenic process, a cryoprotectant is added regardless of how the unit is processed. The cord blood unit can be placed in a liquid nitrogen tank to maintain freezing at 196 °C after being gradually cooled to 90 °C.

### Uses of Cord Blood

- Despite primarily coming from donors, cord blood stem cells are now being used to treat a number of deadly diseases, most notably malignancies, blood disorders, and genetic diseases of the blood and immune system.
- Recent research has revealed that cord blood transplants have special benefits over conventional bone marrow transplants, especially for children.
- In rare circumstances where a suitable bone marrow donor cannot be found, cord blood transplants can even save a patient's life.
- There is a 25% probability that siblings will match, and there is a 50% chance that grandparents and parents will match using cord blood.

### Advantages of Cord Blood Banking

- Compared to bone marrow, more people can obtain stem cells from cord blood. This is due to the fact that, unlike a bone marrow transplant, cord blood does not need to closely match the recipient's own blood.
- The probability that a person's body will reject stem cells from cord blood is lower than that of bone marrow.
- During cancer therapies, cord blood stem cells may help the immune system. This is not a method of using bone marrow stem cells.
- Compared to collecting bone marrow, collecting cord blood is less difficult, uncomfortable, and dangerous for the donor.
- The newborn or the person giving birth is not in danger from the cord blood harvest.

### Concerns Related to Cord Blood Banking

- It may not be wise or effective to use one's own cord blood cells, particularly in situations of leukaemia and cancer in children. Because the blood also carries the same genetic abnormality, children who develop immunological disorders frequently cannot receive a transplant using their own cord blood.
- Additional problems include the potential for the cord blood unit to be contaminated with same cancer that was discovered later in life.

### Conclusion

- Commercial cord blood banking involves storing a newborn's umbilical cord blood stem cells for potential future medical use.
- The decision to bank cord blood is personal and should be based on individual circumstances and considerations such as the family history of genetic disorders and the likelihood of using the stored cells.
- It is important to carefully research and compare different cord blood banking options and consider the cost, storage options, and reputation of the facility before making a decision.

## A MODEL FOR QUALITY AND INCLUSIVE EDUCATION

### Introduction

- The National Institutional Ranking Framework (NIRF), adopted by the Ministry of Education to rank institutions of higher education in India, shows a noteworthy feature of Tamil Nadu. Specifically, the 2023 NIRF ranking of the top 100 colleges in India reveals the consistent success of Tamil Nadu in providing higher education that is both of good quality and inclusive. The Tamil Nadu experience, in congruence with the State's motto of development with social justice, offers an important insight for other States.

### National Institutional Ranking Framework (NIRF)

- The NIRF employs a ranking metric comprising five parameters with varying weightage to assess the quality of colleges: Teaching, Learning and Resources (40%), Graduation Outcome (25%), Research and Professional Practices (15%), Outreach and Inclusivity (10%) and Perception (10%).
- Each of these parameters has several components, which again have varying weightage. Though far from perfect, the metric is reasonably robust as it uses broad-based and curated parameters.
- The number of colleges participating in the NIRF ranking has grown from 535 in 2017 to 2,746 in 2023.

- This five-fold increase notwithstanding, the participating colleges constitute only a paltry proportion of the actual number of colleges in India.
- Since NIRF ranking has already gained wide traction and credibility, it is likely that many good-quality colleges participate in the exercise.
- A place in the top 100 would bring them repute and increase demand for admission. On the contrary, the non-participating colleges are likely to be poor in quality and seriously lacking in most of the parameters of the ranking metric.
- Therefore, it is reasonable to assume that many good-quality colleges participate in the ranking.

#### Share of colleges

- Of the top 100 NIRF-ranked colleges in 2023, Tamil Nadu has the largest share (35). Delhi (32) comes next, followed by Kerala (14) and West Bengal (8).
- These four States collectively contribute to 89% of the top colleges, which speaks volumes about other regions.
- Bigger States such as Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, and Odisha do not have a single college in the top 100. Even the share of the other southern States is abysmal.
- The share of Tamil Nadu (35%) is more than double the combined share of the other four southern States (17%).

#### The Tamil Nadu Model

- The NIRF ranking of colleges since 2017 reveals that Tamil Nadu has been consistent as the lead contributor of top-ranking colleges in India.
- Tamil Nadu is one of the most literate states in India. The state's literacy rate is 80.33% in 2011, which is above the national average.
- Chennai accounts for only nine (26%) colleges. Coimbatore, with an equal share, competes with Chennai quite consistently. Tiruchirappalli, with five colleges (14%), is next.
- This broad pattern was seen in other years too. The largest beneficiaries from Chennai, Coimbatore, and Tiruchirappalli are likely to be urban dwellers. Yet, it is also likely that the top-ranked 23 colleges from these three cities, which belong to three different regions, might be equally serving the poor and disadvantaged social groups both from these regions as well as those contiguous to them.
- This is because Tamil Nadu not only has one of the highest reservation quotas, but also has been quite effective in its implementation of the reservation policy.
- Additionally, since more than one-third of the top-ranked colleges are dispersed across places, they not only cater largely to the rural and under-served areas, but also provide an opportunity for quality education for students from poor and disadvantaged social groups who do not have the economic resources and social networks to study in colleges from Chennai, Coimbatore, and Tiruchirappalli.
- Thus, the colleges based out of Chennai in general and other districts in particular promote both quality and inclusion, and thereby contribute to the goal of development with social justice.

#### Way forward

- Tamil Nadu's impressive and consistent performance in higher education shows that quality and inclusion can be achieved together and consistently.
- This finding should prompt other southern States, which also have a reasonably inclusive and effective social welfare architecture, to introspect why they lag far behind and inspire them to take action to rectify issues.

## RE-EVALUATING INDISCRIMINATE USE OF BMI TO MAKE CONCLUSIONS ON HEALTH

### Introduction

- India is said to be among the least obese countries in the world, with an average Body Mass Index (BMI) of less than 22. BMI – the ubiquitous tool believed to measure fat and fitness – would classify most Indians as healthy. But more Indians than ever are at risk of type 2 diabetes, high blood pressure and cholesterol levels. Obesity, experts warn, is a “ticking time bomb”.

### BMI

- The paradox is built within the tool of choice – the BMI, a simple calculation that divides an individual's weight in kilograms by the square of their height in meters.

- The most-repeated myths about fitness are “the lower the BMI, the healthier you are...or that obesity happens only when you’re not eating well or exercising regularly”. Both claims are misleading and untrue.
- BMI is one method of tracking your weight and identifying potential weight-related problems. Like a Rapid Antigen Test for COVID-19, it may help screen for chronic health conditions without promising the accuracy of an RT-PCR test.

#### **A product of bias**

- Some 200 years ago, a Belgian astronomer and statistician Adolphe Jacques Quetelet wanted to study humans and develop ‘social laws’, like the laws of physics.
- He pored through available datasets to find the ‘average man’, using the height and weight of Caucasian, middle-aged men from France and Scotland.
- The Quetelet’s Index, the first iteration of the BMI, helped identify a type of perfection and intended for it to be a population-level tool only, cautioning its use on individuals.

#### **A complex science**

- Mounting evidence since has led people to reconsider the logic of BMI.
- For one, BMI doesn’t-understand weight entirely, is unable to distinguish between muscle mass and body fat.
- Muscle and bone are denser than fat and thus weigh more; explaining why people with larger body frames (like athletes) have a higher BMI and older adults (who lose muscle mass) tend to rank lower.
- BMI clumsily threads the needle between obesity and mortality, mistaking correlation for causation.
- People who are obese have a high BMI, but it is not necessarily true that a high BMI implies obesity.
- The science around ‘fat’ is constantly evolving. It is known that excess body fat increases the risk of non-communicable diseases, such as type 2 diabetes, heart conditions and 13 types of cancers.
- An analysis in Science journal, however, found ‘obese’ people (with a BMI of 30 or more) carried a lower cardiovascular risk, and those in the ‘normal’ range were metabolically unhealthy and had a higher mortality risk – what it called the “obesity mortality paradox”.

#### **More findings**

- Research has found at least 59 different types of obesity, making one measure of ‘body fat’ impractical.
- The measure also relies only on self-reported weight and height, disregarding other influences such as bone density, muscularity, sex, age, genetic differences, per a study in the International Journal of Obesity.
- Social factors such as poverty and educational so influence weight and obesity.
- Body fat also varies across ethnic and racial groups. Asian Indians, for instance, suffer from the Y-Y paradox, i.e at the same BMI, we have more visceral fat — the fat inside the stomach — than Europeans do.
- Since Indians are prone to abdominal obesity, they are at higher risk of type 2 diabetes and heart diseases, studies show.
- WHO notes that BMI underestimates health risks for or South Asians, and the optimal health for Indians would then be a low BMI.

#### **Conclusion**

- The American Medical Association (AMA) on June 14 this year accepted that BMI was an imperfect way to measure body fat for it does not account for differences across race/ethnic groups, sexes, genders, age-span and had caused historical harm.
- AMA’s decision echoed a longstanding consensus among experts and activists that BMI is flawed, discriminatory and takes away targeted attention from health crises such as the alarming prevalence’ of non-communicable diseases.

# GENERAL STUDIES 3.

## ECONOMY

### MINIMUM SUPPORT PRICE: ISSUES RELATED TO DIRECT AND INDIRECT FARM SUBSIDIES

**Context:** Minimum support price and issues

#### What is MSP?

- MSP is the minimum price paid to the farmer for procuring food crops.
- It offers an assurance to farmers that their realisation for the agricultural produce will not fall below the stated price.
- MSPs are usually announced at the beginning of the sowing season.
- MSP is recommended by the Commission for Agricultural Costs and Prices (CACP).
- Cabinet Committee on Economic Affairs approves MSP.
- The Food Corporation of India procures food grain under the price support scheme.

#### Benefits of MSP

- Incentivise production of a specific food crop which is in short supply.
- Protects farmers from any sharp fall in the market price of a commodity.
- Ensures that the country's agricultural output responds to the changing needs of its consumers.
- Ex: The government hiked the MSP of pulses to expand sowing of pulses.
- Higher farm profits will encourage farmers to spend more on inputs, technology etc
- Protect farmers from the unwarranted fluctuation in prices, provoked by the international level price variations.

#### Importance

- Almost half of India's population is dependent on agriculture for livelihood.
- Farming is a risky business with the farmer's income dependent on the vagaries of weather, as well as local and international price trends. The MSP shields farmers to an extent, from such risks, by guaranteeing a floor price for their produce.
- To achieve food security and tackle shortages of key food items.

#### Concerns / Challenges

- Sharp and frequent increases in MSP can feed inflation too.
- Government procurement at MSP is benefiting the large traders than farmers. Small farmers typically do not have enough marketable surpluses. Their crop is usually sold to traders at low post-harvest prices in the village itself or the nearest mandi.
- The input costs have been rising faster than sale prices, squeezing the meagre income of the small farmers and driving them into debt
- MSP is attractive towards wheat and rice which is produced by large farmers. Small farmers who mostly dependent on vegetables, pulses, coarse grains are at disadvantage.
- The payments are delayed when the farmers are in immediate need of cash.
- purchase centres were located at distance which required high transportation costs

#### Way Forward

- Revision of MSP and its provisions are required. Diversification towards other crops like pulses must be done.
- Systematic administrative mechanism that includes personnel, system, infrastructure and scientific mechanism.
- Pre and post planning for the procurement at every location.
- The monitoring at every phase for the efficiency of the process and accountability of the people involved in its implementation.

## UNWAVERING FOCUS ON PRICE STABILITY

### Context

- The Monetary Policy Committee (MPC)'s latest decision, to extend the pause in the Reserve Bank of India (RBI)'s monetary tightening while staying focused on the withdrawal of accommodation, reflects the rate setting panel's reassuring resolve to keep inflation front and centre of its approach to policy.

### Details

- RBI Governor Shaktikanta Das was unequivocal in asserting that "the best contribution of monetary policy to the economy's ability to realise its potential is by ensuring price stability".
- The MPC's recent unwavering focus on price stability is informed largely by its mandate to achieve the Consumer Price Index (CPI) inflation target of 4%, a goal that it has struggled to actualise right since January 2021.
- Specifically, Mr. Das flagged the spatial and temporal distribution of rainfall during this monsoon in the wake of El Niño conditions, unabated geopolitical tensions, uncertainty over international commodity prices including those of sugar, rice and crude oil, and the volatility in global financial markets as upside risks to the MPC's inflation projections.
- Another key factor feeding into the RBI's policy approach is its conviction that macroeconomic fundamentals have strengthened after the unrelenting focus on preserving price and financial stability.

### RBI's Monetary Policy

- Monetary policy refers to the policy of the central bank – ie Reserve Bank of India – in matters of interest rates, money supply and availability of credit.
- It is through the monetary policy, RBI controls inflation in the country.
- RBI uses various monetary instruments like REPO rate, Reverse RERO rate, SLR, CRR etc to achieve its purpose.

### Expansionary and Contractionary Monetary Policy

- The monetary policy can be expansionary or contractionary.
- An expansionary monetary policy is focused on expanding (increasing) the money supply in an economy. An expansionary monetary policy is implemented by lowering key interest rates thus increasing market liquidity.
- A contractionary monetary policy is focused on contracting (decreasing) the money supply in an economy. A contractionary monetary policy is implemented by increasing key interest rates thus reducing market liquidity.

### Main goal of Monetary Policy of India

- The primary objective of monetary policy is to maintain price stability while keeping in mind the objective of growth. Price stability is a necessary precondition for sustainable growth.
- To maintain price stability, inflation needs to be controlled. The government of India sets an inflation target for every five years. RBI has an important role in the consultation process regarding inflation targeting. The current inflation-targeting framework in India is flexible in nature.

### Flexible Inflation Targeting Framework (FITF)

- Now there is a flexible inflation targeting framework in India (after the 2016 amendment to the Reserve Bank of India (RBI) Act, 1934).
- The amended RBI Act provides for the inflation target to be set by the Government of India, in consultation with the Reserve Bank, once every five years.
- The Central Government has notified 4 per cent Consumer Price Index (CPI) inflation as the target for the period from August 5, 2016, to March 31, 2021, with the upper tolerance limit of 6 per cent and the lower tolerance limit of 2 per cent.

### Conclusion

- Price stability is after all a public good and achieving durable disinflation must remain a non-negotiable goal, especially amid widening income inequality and high levels of joblessness.

## STATUS OF TRANSGENIC CROPS IN INDIA

### Context

- Three States, Gujarat, Maharashtra and Telangana, have deferred a proposal, approved by the Centre's Genetic Engineering Appraisal Committee (GEAC), to test a new kind of transgenic cotton seed that contains a gene, Cry2Ai, that purportedly makes cotton resistant to pink bollworm, a major pest. This conflict shows that a broad acceptance of genetically modified crops continues to be elusive.

### Genetic Engineering Appraisal Committee (GEAC)

- The GEAC consists of a panel of plant biotechnologists and is headed by a senior official of the Environment Ministry and co-chaired by the scientist of the DBT.
- To resolve the issue of States not according approvals on testing, because of differing attitudes to GM crops, the GEAC is considering a proposal by the DBT to declare some regions across India as 'notified testing sites'.
- There are 42 such proposed sites and, if it goes through, companies wanting to conduct trials of GM crops at these locations won't need the permission of States for trials.

### Status of transgenic crops in India

- There is an array of crops — brinjal, tomato, maize, chickpea — in various stages of trials that employ transgenic technology. However, cotton remains the only transgenic crop that is being commercially cultivated in India.
- After a long hiatus, the GEAC, the apex technical body approved the environmental release of Mustard hybrid DMH-11 and its parental lines, for seed production and testing. This is one step away from full commercial cultivation.
- However, the GEAC, which is under the Union Environment Ministry, isn't the final arbiter in the case of GM crops. There is a long-standing litigation in the Supreme Court on the permissibility of allowing transgenic food crops in farmer fields based on petitions filed and asking for a stay on the release of the crop because it would encourage farmers to spray herbicides, which are banned in India.
- In 2010, the GEAC had approved GM brinjal, but this was put on an "indefinite moratorium" by the United Progressive Alliance government.

### Process of regulating transgenic crops in India

- The process of developing transgenic crops is an elaborate one as inserting transgenic genes into plants to elicit a sustained, protective response is a mix of both science and chance.
- There are multiple safety assessments done by committees before they are cleared for further tests in open plots of lands, which are located at either agricultural universities or are plots controlled by the Indian Council for Agricultural Research (ICAR).
- A transgenic plant can apply for commercial clearance, only after it has proven to be demonstrably better than comparable non-GM variants on claimed parameters (for instance, drought tolerance or insect resistance) without posing ecological harm to other species that may be being cultivated in the vicinity.
- Open field trials often take place over multiple crop seasons, and types of geographical conditions, to assess its suitability across different States.

### Advantages of GMO crops

- It improves production and raises the farmer's income.
- It reduces the use of pesticide and insecticide during farming that might be great moves for the betterment of the food supply.
- It can feed a rapidly increasing population because it shows dramatically increased yields.
- It can produce more in small areas of land.

### Disadvantages

- The production imposes high risks to the disruption of ecosystem and biodiversity because the "better" traits produced from engineering genes can result in the favouring of one organism. Hence, it can eventually disrupt the natural process of gene flow.
- It increases the cost of cultivation and is more inclined towards marketization of farming that works on immoral profits.
- The transgenic crops endanger not only farmers but also the trade, and the environment as well.



- The current safety assessments are inadequate to catch most of the harmful effects from the GM crops. Moreover, the regulatory regime in India about GM crops has never been assessed thoroughly about the GM risk assessment in Indian conditions.

#### Way Ahead

- The challenges linked to GM crops need to be addressed by governments, especially in the areas of safety testing, regulation, industrial policy and food labelling.

## RESPONSIBILITY AND THE COMPLEXITIES OF CLIMATE LEADERSHIP

### Context

- Over the last few weeks, there has been an increasingly vocal campaign to unseat the President-Designate of COP28, Minister Sultan Al Jaber of the host nation, the United Arab Emirates (UAE).

### Background

- This includes a recent letter from United States and European parliamentarians calling for his removal on the grounds that he is CEO of the Abu Dhabi National Oil Company.
- As representatives of developing countries in the climate change front line, and as leaders of the Climate Vulnerable Forum, a group of 58 of the world's most climate vulnerable countries hosting 1.5 billion of the world's poorest people, we know only too well the urgency of the climate challenge.
- We have endured climate-related economic losses of \$500 billion in the last two decades alone.

### This is a journey of unity

- However, recognising that this journey, towards a clean energy future, is one we must embark on together.
- Fossil fuel-dependent economies are critical to these efforts, and they clearly have a more difficult task defining their energy transition strategy.
- It is important to avoid division and continue to engage the fellow parties at COP28 and elsewhere on the best way forward for their economies and for the planet.  
Finance will be crucial for COP28.

### Debt is a barrier

- Many of the nations are crippled by unsustainable debts, including debts which are becoming unpayable due to climate damages largely caused by emissions elsewhere.
- Rather than going one by one over the financial cliff, we urgently need a collective approach which recognises the debt problem and the barrier it now poses to clean energy investment and climate adaptation.
- Sovereign wealth funds and multilateral development banks (MDBs) could assist in de-risking restructured debts and insuring re-issued climate bonds,
- The UAE leadership for a clean energy target starting in 2025, transforming the Abu Dhabi National Oil Company into the Abu Dhabi Clean Energy and Grid Company by 2030, and towards global financial reform including of the International Monetary Fund.
- The Loss and Damage fund that was secured last year in Sharm El-Sheikh must not be just be another empty bank account, and fossil fuels-dependent economies can demonstrate their commitment to a shared future by making subscriptions to support funding for climate damages in the most vulnerable countries, well in advance of the COP.
- Holding COP28 in the UAE, and with Sultan Al-Jaber as COP President-Designate, may well be an opportunity to engage the fossil fuels industry to make some significant and quantifiable commitments to emissions cuts and climate action in general.

### Key Points emphasized by the COP28 president-designate Sultan Ahmed Al Jaber:

- Methane Emissions and Net-Zero Plans.
- Inclusive Energy Transition and Climate Justice.
- Maximizing Technology Adoption and Climate Finance.
- Renewable Energy Capacity and Hydrocarbons.
- Carbon Capture Technologies and Industrial Emissions.
- Breakthroughs in Battery Storage, Nuclear Energy, and Fusion.

## Conclusion

- There are no winners and losers in a global climate breakdown. Instead of seeking to exclude relevant parties and stakeholders, we believe everyone should participate in decisions with such important ramifications.
- Time is running out, and we all need to work together to save the 1.5°C Paris target before it is too late.

## THE CONCERNS ABOUT INDIA-U.S. DIGITAL TRADE

### Context

- During Prime Minister Narendra Modi's U.S. state visit, cooperation on technology emerged as a prominent talking point and yielded some of the most substantive outcomes, according to Foreign Secretary Vinay Kwatra.

### The current status of India-U.S. technology trade

- Notably, in FY2023, the U.S. emerged as India's biggest overall trading partner with a 7.65% increase in bilateral trade to \$128.55 billion in 2022-23.
- However, digital or technology services did not emerge as one of the sectors at the forefront of bilateral trade.
- The Computer & Communications Industry Association (CCIA) headquartered in Washington DC points out in its report that "despite the strength of the U.S. digital services export sector and enormous growth potential of the online services market in India, the U.S. ran a \$27 billion deficit in trade in digital services with India in 2020".
- In the recent past, however, the two countries have been ramping up their tech partnership through moves like the Initiative on Critical and Emerging Technology (iCET) announced by President Joe Biden and Prime Minister Narendra Modi last year.
- Additionally, under the iCET, India and the U.S. also established a Strategic Trade Dialogue with a focus on addressing regulatory barriers and aligning export controls for smoother trade and "deeper cooperation" in critical areas.

### Concerns of U.S. tech firms

- The CCIA, while appreciating the reinvigorated efforts to ramp up trade through bilateral initiatives, has flagged in its note, the "significant imbalance" and "misalignment" in the U.S.-India economic relationship.
- They also addressed that the U.S.'s extension of market access, trade and openness to Indian companies to operate and succeed in the U.S. has not been reciprocated by the Indian side.
- Adding that the Indian government has deployed a range of tools to champion their protectionist industrial policy tilting the playing field away from U.S. digital service providers in favour of domestic players.
- To describe these discriminatory regulation and policies, it cites the example of India's guidelines on the sharing of geospatial data, which it accuses of providing preferential treatment to Indian companies.
- It has also expressed discontent over India's veering away from longstanding democratic norms and values, and seeking greater government censorship and control over political speech which it argues has made it extremely challenging for U.S. companies to operate in India.

### Concerns of taxation measures

- One of the taxation tools that U.S. tech firms have long taken exception to is the expanded version of the "equalisation levy" that India charges on digital services.
- India in 2016, with the goal of "equalising the playing field" between resident service suppliers and non-resident suppliers of digital services imposed a unilateral measure to levy a 6% tax on specific services received or receivable by a non-resident not having a permanent establishment in India, from a resident in India who carries out business.
- The equalisation levy, when it was first introduced in 2016, led to double taxation and further complicated the taxation framework.
- Besides, it also raised questions of constitutional validity and compliance with international obligations. The 2020 amendment again led the levy to become sweeping and vague in its scope.

### India's IT Rules 2021

- The Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021, has been flagged by the consortium of foreign tech firms under the some of the most “problematic policies”.
- The IT Rules place compliance burden on social media intermediaries (SMIs) and platforms with five million registered users or more, which means several U.S. firms end up falling under the ambit.

### **Suggestions**

- The IT Rules require intermediaries to take down content within 24 hours upon receiving a government or court order.
- The platforms are also required to appoint a local compliance officer.
- Moreover, with the amendments made to the Rules late last year, SMIs are now obligated to remove, within 72 hours, information or a communication link in relation to the six stipulated prohibited categories of content as and when a complaint arises.
- There is also major criticism against the government’s institution of the three-member Grievance Appellate Committees (GAC), which will hear user complaints about the decisions of SMIs regarding their content-related issues and have the power to reverse those decisions.
- The CCIA argues that instead of taking this “opaque” approach, the law could be strengthened by “proactively supporting cross-border data flows through certifications, standard contractual clauses and binding corporate rules”.

### **Conclusion**

- India, with more than 759 million active internet users representing more than 50% of its population is a gold mine for data. The country is also planning to become a hub for data processing, wanting to host data centres and cloud service providers. This means that India’s policy on the flow of data across borders will impact the same on a global level, as was seen with the European Union’s landmark General Data Protection Regulation (GDPR).

## **THE OPEN MARKET SALE SCHEME FOR WHEAT AND RICE**

### **Context**

- The Food Corporation of India’s imposed quantity restrictions followed by the refusal to allow States to procure the two food grains through its Open Market Sale Scheme.

### **Aftermath**

- States have been looking at alternative ways of procuring wheat and rice in the after the Food Corporation of India’s (FCI) imposed quantity restrictions followed by the refusal to allow States to procure the two food grains through its Open Market Sale Scheme (OMSS).
- The Centre has made it clear that the reason for restricting supplies per bidder and eventually excluding states from procuring through auctions was to curb inflation and regulate supply,
- States such as Karnataka and Tamil Nadu have criticised the government for engaging in “politics” at the expense of marginalised beneficiaries of State welfare schemes.

### **Open Market Sale Scheme**

- Under the Open Market Sale Scheme, the FCI from time to time sells surplus food grains from the central pool especially wheat and rice in the open market to traders, bulk consumers, retail chains and so on at pre-determined prices.
- The FCI does this through e-auctions where open market bidders can buy specified quantities.
- States are also allowed to procure food grains through the OMSS without participating in the auctions, for their needs beyond what they get from the central pool to distribute to NFSA (National Food Security Act) beneficiaries.

### **Centre’s revised version of OMSS**

- The Centre decided to restrict the quantity that a single bidder can purchase in a single bid under the OMSS.
- While the maximum quantity allowed earlier was 3,000 metric tonnes (MT) per bid for a buyer, it will now range from 10-100 metric tonnes.

- The FCI claims that the quantities have been reduced this time to accommodate more small and marginal buyers and to ensure wider reach of the scheme.
- The objective behind the move is also to curb retail prices as allowing smaller bids should ideally break monopolies of bulk buyers, allowing more competitive bids by small buyers.

#### **Features of OMSS**

- The FCI conducts weekly auctions through e-auctions in the open market to sell surplus stocks of wheat and rice.
- The reserve price of wheat and rice for sale under OMSS is fixed by the Department of Food and Public Distribution (DFPD) every year.
- The reserve price is kept uniform throughout the country without adding any further freight to facilitate buyers to lift stocks from any place at ease.
- The sale of wheat and rice under OMSS is undertaken throughout the year in the non-procuring states and during the non-procurement period in the procuring states.
- The quantum of wheat and rice for sale under OMSS is decided by the DFPD based on the availability and demand of food grains.
- The surplus procuring states (paddy/rice) are not allowed to participate in e-auction for the purchase of rice for their state schemes and they are advised to retain stocks under the state pool for their schemes.

#### **Significances of OMSS**

- Enhance the supply of food grains
- Prevent wastage and deterioration of food grains
- Provides an alternative source of food grains
- Generates revenue for the FCI

#### **Challenges faced by OMSS:**

- Low demand from the buyers
- Logistical challenges
- Limited impact on stabilizing the market prices
- Does not address the structural problems

#### **Way forward for OMSS**

- Revising the reserve prices of food grains
- Improving logistics and quality management
- Diversifying product portfolio
- Coordinating with state governments
- The FCI should also ensure transparency and accountability in its operations under OMSS.

#### **Conclusion**

- OMSS is a useful tool for managing excess stocks of food grains in India. It has several features, significances, advantages and disadvantages. It also faces some challenges that need to be addressed. By adopting some measures to improve its functioning, OMSS can play a vital role in ensuring food security and price stability in the country.

## INFRASTRUCTURE RAILWAYS.

### REFORMS IN RAILWAYS

#### Importance

There is no railway system quite like the Indian railways. Trains remain an essential lifeline in India, the world's most populous country of 1.4 billion people, carrying about 13 million passengers a day

- The Indian Railways is the lifeline of India. With its vast network across the length and breadth of India, it is not just a mere transporter of passengers and goods but also a social welfare organization.
- Indian Railways (IR) has the 4th longest rail network in the world. It is a network of 70,000 km and runs about 21,000 trains, carrying 23 million passengers and 3 million tons of freight per day.
- Railways stretch their hands in conducting activities like business, sightseeing, pilgrimage along with transportation of goods.
- It is easier for long-distance travel.
- Plays a vital role in national integration.
- Railways hold a major hand in the economy of the country
- It strengthens the development of the industry and agriculture.
- Railways are the most preferred transport.
- They have the capacity to carry huge loads and bulky goods for long and short distances.

#### Government Initiatives

- Billions have been spent to upgrade and modernize the railway, including a plan to have 100% electrification of the railways by 2024 and the aim for them to go net zero by 2030.
- The railways are also in the process of installing an anti-train collision system, which causes trains to brake automatically
- The government has set a vision of making railways a 100% safe, fast and reliable mode of transport for passengers and freight.
- Dedicated freight corridor
- Diamond quadrilateral network of high-speed rail
- Rising passenger & freight traffic
- Track strengthening
- Elimination of curves and level crossing gates and
- Strengthening of bridges.
- Track fencing especially in densely populated areas.
- Recently there has been a record allocation of funds for infrastructure and safety upgrades, with a particular focus on the introduction of modern new stations and high-speed Vande Bharat – translating as “salute to India”

#### Issues in Railways

##### safety concerns

- Rising on the railways and the number of consequential rail accidents on Indian Railways increased by 37% last year. It is a “matter of grave concern”.
- Derailments of trains remain the main cause. Trains to brake automatically, so far operational on 2% of the network only
- Technology had yet to be installed and upgraded on India's oldest and busiest routes in terms of passengers and trains carrying oil and coal.
- Till January ,2023, 3.12 lakh posts were vacant in the Indian railways these include vacant posts in safety, maintenance and engineering

#### Service Quality is not up to the mark

- Overburdening of the Railway infrastructure due to heavy passenger load. There laying of new tracks is at slow speed. There is little capital expenditure on the railways.

- The number of stranded projects is also high in Railways.
- Quality of food served to passengers by the Indian railways is not satisfying.
- Dirty Blankets for AC compartments
- There are rising complaints over unclean toilets and sanitation accessories provided to the passengers.
- Redressal mechanism –The complaints raised by passengers on different issues are not addressed properly by the authorities

### Way ahead

- While the focus has been on glossy modernization projects, safety remains the biggest problem for the Indian railways. An increasing number of trains have been put on the tracks to meet demand yet the workforce has not risen at the same level, leading to greater pressures on staff and more human error. Reforms are needed in IR to ensure that it meets the requirements. To contribute comprehensively in Indian development IR needs administrative reforms, to improve services and efficiency and engineering reforms, to improve cost and environmental effectiveness

## RAILWAY SAFETY

### Introduction

- Nothing focuses the nation's collective attention on the Indian Railways as a major accident. The triple train collision at Bahanaga Bazar railway station, near Balasore in Odisha on June 2, which led to the tragic loss of over 280 lives, has evoked all the expected responses from various quarters, offering explanations as to how the accident occurred and remedial measures to prevent accidents in the future, and comparisons with Railway systems abroad. In short, there is an overwhelming sense of déjà vu.

### Safety and the information flow

- This concerns the flow of information regarding unsafe practices or situations on a real-time basis.
- Unlike many other organisations or industries, where the activities or operations are concentrated more or less in a limited area physically the activities of the Railways are spread geographically over a wide area, involving a multiplicity of disciplines (departments) that need to work in close coordination on a real-time basis to ensure the smooth and safe running of trains.
- In order to ensure uniformity in the compliance of rules and regulations and safety in operations, a large number of codes and manuals have been evolved for different departments over the decades to standardise the procedures as far as possible.

### Top-down approach

- Ever since the inception of the railways in this country, periodic field inspections by authorities at various levels have been one of the main tools for the management to ensure compliance with laid-down procedures and standards of workmanship.
- While this system has, by and large, stood the test of time over the decades, it suffers from a few drawbacks, particularly in the context of railway safety.
- By its very nature, the "top-down" approach places the onus of detecting deviations from the norm on the higher authorities.
- It becomes a veritable "cops and robbers" scenario, in which the higher authority looks down on the staff at the cutting-edge level with suspicion and distrust; and, conversely, the staff at the lower levels adopt an attitude of "catch me if you can".
- It encourages window dressing and sweeping of problems under the carpet. Transparency and frankness are usually the casualties in such a situation.
- Detection and rectification of such deviations at the earliest opportunity can prevent many unsafe situations from developing into serious accidents.
- While in every case a remedy may not be available, even becoming aware of the shortcomings on a real-time basis can often help the management in avoiding a major disaster.
- Confidential Incident Reporting and Analysis System (CIRAS)
- The system was developed by one of the British universities nearly three decades ago for application on the British Railways in the mid-1990s.

- The underlying philosophy is to encourage the lower staff to point out deviations on a real-time basis, maintaining the confidentiality of the reporter, and encouraging the expression of frank views.
- The system, in effect, turns the conventional top down inspection on its head. This is in fact an example of real empowerment of staff.
- With the rapid advances in communications and information technology since CIRAS was developed nearly three decades ago, the introduction of a similar reporting system on the Indian Railways should not be difficult.
- However, there is a need to sound a note of caution. The success and effectiveness of a CIRAS-like reporting system depends not only on putting in place the physical infrastructure but also a total change in the mindset of the management, from the highest to the lower levels, vis-à-vis the staff at the field level.
- There has to be an attitudinal change from the conventional approach of fault-finding and punishment to a more enlightened ethos of a shared commitment to ensure safety at all levels.
- The aim should be to correct, not punish. Listen to the voices from below and act. Effecting this change is not easy.

#### **Way forward**

- Perhaps it is time to have a serious rethink on the recently introduced Indian Railways Management Service (IRMS) scheme, which is bound to destroy whatever loyalty and sense of “ownership” that exists towards a particular discipline (department) amongst the management cadre.
- It is perhaps also time to revert to the earlier system of having a full-time Cabinet Minister for the Railways.
- Unprecedented levels of investments at a time when the organisation is going through a challenging phase of transformation amidst many external challenges requires undivided attention at the highest policy-making level.

CivilsTap Hlmachal

## SCIENCED AND TECHNOLOGY

### FRUIT FLY A TEST BED FOR GENETIC RESEARCH

#### Context

Thousands of neuroscientists use fruit flies to study learning, memory, sleep, aggression, addiction and neural disorders – not to mention cancer and ageing, processes of development, the gut microbiome, stem cells, muscles and the heart

#### Diptera

- Flies and mosquitoes both belong to Diptera, the group of insects that have only two wings.
- The Order Diptera (true flies) includes many common insects such as mosquitoes, midges, sand flies, blowflies and the House Fly.
- Most of the insects we see flying around do so with four wings (two pairs), but dipterans (meaning 'two wings') use only one pair. The other pair of wings is reduced to club-like structures known as 'halteres' that they use for balance.

#### Common characteristics of the order include

- One pair of wings (forewings)
- Hindwings reduced to club-like halteres
- A large and moveable head
- Compound eyes that are often very large
- Sucking, piercing and sucking or sponge-like mouthparts (all adapted for a liquid diet)
- The mesothorax (middle segment of the thorax or mid-body) is enlarged, with the prothorax and metathorax small
- Complete metamorphosis, with larvae (maggots) that are always legless, with chewing mouthparts or mouth-hooks, and that often pupate within a hardened case (puparium)

#### The fruit fly or vinegar fly (*Drosophila melanogaster*)

- The species *Drosophila* was first mentioned by German entomologist Johann Meigen in 1830 and has since earned a celebrity status among scientists.
- It has become the best-understood animal organism on the planet and a powerhouse of modern medical research.
- *Drosophila melanogaster* has been used as a model organism for over a century.
- Mutant-based analyses have been used extensively to understand the genetic basis of different cellular processes, including development, neuronal function and diseases.

#### Helping science

- Morgan was not the first to work with *Drosophila*. But his idea to harness the fly's cheap husbandry (pieces of banana kept in milk bottles), and rapid reproduction (one generation in about ten days; about 100 eggs per female per day) would make it possible to study evolution in the laboratory.
- His mass-breeding experiments with hundreds of thousands of flies led to the discovery of a single fly with white eyes, instead of the red eyes fruit flies normally have. Morgan and his team's subsequent studies of its white-eyed progeny revealed that genes can mutate and are arranged into orderly and reproducible maps on chromosomes (a long DNA molecule). It led to an understanding of how genetic disease is inherited.
- In the 1940s, scientists, including George Beadle and Edward Tatum, established that some gene codes for proteins can facilitate chemical reactions and produce the molecules needed in cells.
- Scientists can study mutant defects, even if the eggs never hatch, which can then inform us about the normal function of the affected gene. These kinds of genetic studies of *Drosophila*, combined with emerging technologies, such as gene cloning, helped us understand how gene networks can determine the development of a body and how they can sometimes cause inherited disorders.

#### A startling likeness



- The common ancestor that founded the evolutionary lines of flies and humans, half a billion years ago, appears to have been equipped with biology so well-designed that many of its aspects are still maintained, such as mechanisms of growth or neuronal function.
- Because we are so alike genetically, many aspects of human biology and disease have been explored first in *Drosophila*. Meanwhile, research on fruit flies is fast, cost-effective and extremely versatile. It's ideal for scientific discoveries.
- It is used by neuroscientists for studying learning, memory, sleep, aggression, addiction and neural disorders. Not to mention cancer and ageing, processes of development, the gut microbiome, stem cells, muscles and the heart.

### Conclusion

- Fruit flies hovering in your kitchen might be aggravating, but hopefully you will see them in a different light now.

## ARTIFICIAL INTELLIGENCE

### Introduction

- Artificial Intelligence (AI) has been dominating the headlines for its triumphs, and also fears being expressed by many including some of the best minds in AI. Several leading AI experts and thinkers have been part of different cautionary messages about AI. There is deep concern about AI among many who know it.

### Artificial intelligence

- Artificial General Intelligence (AGI) refers to intelligence that is not limited or narrow. Think of it as human "common sense" but absent in AI systems.
- Common sense will make a human save his life in a life-threatening situation while a robot may remain unmoved.
- There are no credible efforts towards building AGI yet.
- Many experts believe AGI will never be achieved by a machine; others believe it could be in the far future.

### Areas of use, limitations and AGI

- AI systems are capable of exhibiting superhuman performance on specific or "narrow" tasks, which has made it to the news in the field of games like chess and also in biochemistry for protein folding.
- The performance and utility of AI systems improve as the task is narrowed, making them valuable assistants to humans. Speech recognition, translation, and even identifying common objects such as photographs, are just a few tasks that AI systems tackle today, even exceeding human performance in some instances.
- Their performance and utility degrade on more "general" or ill-defined tasks. They are weak in integrating inferences across situations based on the common sense humans have.

### ChatGPT – AI Tool

- ChatGPT is a generative AI tool that uses a Large Language Model (LLM) to generate text.
- LLMs are large artificial neural networks that ingest large amounts of digital text to build a statistical "model".
- Several LLMs have been built by Google, Meta, Amazon, and others.
- ChatGPT's stunning success in generating flawless paragraphs caught the world's attention. Writing could now be outsourced to it.
- Some experts even saw "sparks of AGI" in GPT-4; AGI could emerge from a bigger LLM in the near future.
- True AGI will be a big deal if and when it arrives. Machines outperform humans in every physical task today and AGI may lead to AI "machines" bettering humans in many intellectual or mental tasks.
- Bleak scenarios of super-intelligent machines enslaving humans have been imagined. AGI systems could be a superior species created by humans outside of evolution.
- AGI will indeed be a momentous development that the world must prepare for seriously.

### The dangers

- Superhuman AI: The danger of a super intelligent AI converting humans to slaves.
- Malicious humans with powerful AI: AI tools are relatively easy to build. Even narrow AI tools can cause serious harm when matched with malicious intent. LLMs can generate believable untruths as fake news and create deep mental anguish leading to self-harm. Public opinion can be manipulated to affect democratic elections. AI tools work globally, taking little cognisance of boundaries and barriers.
- Highly capable and inscrutable AI: AI systems will continue to improve and will be employed to assist humans. They may end up harming some sections more than others unintentionally, despite the best intentions of their creators.
- Another worry is about who develops these technologies and how. Most recent advances took place in companies with huge computational, data, and human resources. ChatGPT was developed by OpenAI which began as a non-profit and transformed into a for-profit entity. Other players in the AI game are Google, Meta, Microsoft, and Apple. Commercial entities with no effective public oversight are the centres of action.

### India must be prepared

- Awareness and debate on these issues are largely absent in India.
- The adoption of AI systems is low in the country, but those used are mostly made in the West.
- We need systematic evaluation of their efficacy and shortcomings in Indian situations.
- We need to establish mechanisms of checks and balances before large-scale deployment of AI systems.
- AI holds tremendous potential in different sectors such as public health, agriculture, transportation and governance.
- As we exploit India's advantages in them, we need more discussions to make AI systems responsible, fair, and just to our society.
- The European Union is on the verge of enacting an AI Act that proposes regulations based on a stratification of potential risks.
- India needs a framework for itself, keeping in mind that regulations have been heavy-handed as well as lax in the past.

### Conclusion

- Everything that affects humans significantly needs public oversight or regulation. AI systems can have a serious, long-lasting negative impact on individuals. Yet, they can be deployed on mass scale instantly with no oversight.

## THE REMARKABLE ENDURANCE OF THE Y CHROMOSOME, 'MASTER OF MALENESS'

### Context

- The Y chromosome, often referred to as the "master of maleness", has long captivated scientists and historians alike.

### Y chromosome

- In humans, in addition to the 22 pairs of chromosomes in each, we have a pair of sex chromosomes called X and Y.
- Sex as a specification is determined by these sex chromosomes. They carry sex-determining genes.
- All biological males have X and Y chromosomes and all biological females have two X chromosomes.
- The 'sex-determining region Y' on the Y chromosome determines the biological male sex.

### 'Juvenile delinquent'

- Estimated to have emerged around 200-300 million years ago in a common ancestor of all mammals, the Y chromosome has had a unique genetic journey, and embedded within its DNA lies a remarkable tale of evolution.
- Scientists published the complete genetic sequence of the Y chromosome in 2003. This sequence provided an outline of 23 million bases of the 60 million or so bases that together make up the Y chromosome.
- In total, the chromosome encoded for only 55 genes and accounted for around 2% of the genetic material inside a cell.

- Many researchers jokingly refer to the Y chromosome as the “juvenile delinquent” among chromosomes pertaining to its abundance of repetitive sequences, poor functional utility (with a small number of genes), reluctance to socialise (i.e. recombine with other chromosomes), and a high proclivity to degenerate over the course of evolution.
- Indeed, because it has little potential to recombine, the diminutive Y chromosome has been passed from father to son, carrying the legacy of generations.

### Vital genes

- In a landmark genetic study, published in March 2003 in the American Journal of Human Genetics, researchers reported that around 0.5% of all the men in the world have inherited a Y chromosome from the Mongol emperor Genghis Khan or one of his descendants.
- Y chromosome possesses genes that are vital to biological functions, including those linked to ageing and lifespan regulation.
- In the animal kingdom (including mammals), scientists have noticed substantial differences in lifespan between the sexes: the females tend to live longer than the males.
- This phenomenon has been attributed largely to the absence of a second Y chromosome in males, exposing the deleterious mutations in the X chromosome.
- It is also well known that men lose the Y chromosome with age and that this is associated with a higher frequency of cancers, Alzheimer’s disease, and a shorter lifespan.

### Losing the Y

- Studies have shown that LoY in humans occurs with age and is associated with several debilitating medical conditions – a finding that has been validated in mice with LoY, resulting in weak heart muscles (cardiomyopathy), stretched or thickened heart tissue (fibrosis), and heart failure.
- researchers have also found that the pathological effects observed on account of LoY in mice’s hearts could be negated by transforming growth factor beta 1-neutralising antibodies, suggesting a potential treatment for this medical condition in future.
- The human Y chromosome is about one-third as big as the X chromosome. So, many animal species, including humans, have a genuine fear of losing the Y chromosome in the distant future.

### Conclusion

- Genome sequences of the Neanderthals, an ancient relative of the modern human, harbour telltale signs of the replacement of the Y chromosome beginning from modern humans. This suggests that such replacement is not new to the human lineage, and that it is quite possible that the Y chromosome may have to relinquish its coveted title of “master of maleness” to another chromosome in the times to come.

## ARE PHONONS, PARTICLES OF SOUND, QUANTUM TOO?

### Introduction

- Quantum computers and artificial intelligence are two of the emerging areas of interest in the realm of computing. Recently, IBM published a paper in which it claimed to have demonstrated that a quantum computer could solve a useful problem that today’s conventional computers can’t, a result merited by concerns that their computations might become too unreliable when they also become complicated.

### Defining qubits

- Quantum computers use qubits as their basic units of information.
- A qubit can be a particle — like an electron; a collection of particles; or a quantum system engineered to behave like a particle.
- Particles can do funky things that large objects, like the semiconductors of classical computers, can’t because they are guided by the rules of quantum physics.
- The premise of quantum computing is that information can be ‘encoded’ in some property of the particle, like an electron’s spin, and then processed using these peculiar abilities.
- As a result, quantum computers are expected to perform complicated calculations that are out of reach of the best supercomputers of today.

- Other forms of quantum computing use other units of information. For example, linear optical quantum computing (LOQC) uses photons, the particles of light, as qubits.

### Understanding phonons

- Physicists thus wondered whether they can use phonons as qubits.
- Photons are packets of light energy; similarly, phonons are packets of vibrational energy.
- While researchers can manipulate electrons using electric currents, magnetic fields, etc. and photons with mirrors, lenses, etc, they needed new tools to manipulate phonons.
- Beam-splitters are used widely in optics research. Imagine a torchlight shining light along a straight line. This is basically a stream of photons.
- When a beam-splitter is placed in the light's path, it will split the beam into two, that is, it will reflect 50% of the photons to one side and let the other 50% pass straight through.
- When the single wave interacts with the beam-splitter, it enters a superposition of the two possible outcomes — reflected and transmitted. When these states recombine, an interference pattern shows up.

### Types of Phonons

- When the unit cell consists of more than one atom, the crystal will contain two types of phonons. Thus, there are two types of phonons that we study in condensed matter physics:
- Acoustic Phonon: In acoustic phonons, both positive and negative ions swing together.
- Optical Phonon: In optical phonons, both positive and negative ions swing against each other. The optical phonons are excited easily by light.

### Properties of Phonons

- Phonons are often used as a quasiparticle; some popular research has shown that phonons and protons may indeed have some kind of mass and be affected by gravity.
- phonons are said to have a kind of negative mass and negative gravity.
- phonons are known to travel faster (with maximum velocity) in denser materials.
- It is projected that phonons would deflect away as it detects the difference in densities, exhibiting the qualities of a negative gravitational field.
- Phonons have also been predicted to play a key role.
- They can also be used as quasiparticles.
- They can be affected by gravity.
- They tend to have negative energy and negative mass.
- They travel faster in denser material (with higher velocity).

### Conclusion

- Phonon is an important topic of study in solid state physics and condensed matter physics. It is studied because, most physical structures such skyscrapers, are subjected to crystal vibrations. This vibrations are direct consequence of phonon. Therefore, as a physicists and engineers, we can regulate the strength of vibrations by calculating a good estimate of relations between, frequency, wave vector, and energy. Therefore, studying phonon is encouraged.

## REMEMBERING ALEX MÜLLER FOR RESHAPING SUPERCONDUCTORS

### Introduction

- **Karl Alexander (Alex) Müller** (1927–2023) was a Swiss physicist and Nobel Prize laureate. He was widely regarded as one of the most important figures in the history of superconductivity, and his discovery of high-temperature superconductors has had a profound impact on the field of solid-state physics and beyond.

### Defining Superconductors

- A superconductor is a material that attains superconductivity, a state of matter with no electrical resistance. In a superconductor, an electric current can persist indefinitely.
- Superconductors are different from ordinary conductors, such as copper.

- Unlike regular conductors whose resistance gradually reduces, the superconductor's resistance drops to zero below a fixed temperature, which is the critical temperature.
- At this temperature, a superconductor can conduct electricity with no resistance, which means no heat, sound, or other forms of energy would be discharged from the material when it reaches the "critical temperature" ( $T_c$ ).
- To become superconductive, most materials must be in an incredibly low energy state (very cold). Presently, excessive energy must be used in the cooling process, making superconductors uneconomical and inefficient.
- Some of the popular examples of superconductors are **aluminium, magnesium diboride, niobium, copper oxide, yttrium barium and iron pnictides.**

### Superconductor Types

Superconductors come in two distinct types: type I and type II.

- **Type I Superconductors**

A type I superconductor consists of fundamental conductive elements that are used in everything from electrical wiring to computer microchips.

- **Type II Superconductors**

A type II superconductor comprises metallic compounds such as lead or copper. They achieve a superconductive state at much higher temperatures compared to type I superconductors. Type II superconductors can be penetrated by a magnetic field, whereas type I cannot.

### Superconductivity Applications

- **MRI machines:** Superconducting magnets are an essential component of MRI machines, which use strong magnetic fields and radio waves to produce detailed images of the inside of the human body.
- **Particle Accelerators:** Superconducting magnets are also used in particle accelerators, which are used to study the behaviour of subatomic particles.
- **Power Transmission Cables:** Superconducting materials can be used to create power transmission cables that have almost no electrical resistance.
- **Electric Motors and Generators:** Superconducting materials can be used to create more efficient electric motors and generators, which are essential components of many machines and devices.
- **Superconducting Quantum Computers:** Superconducting materials are also being used to develop quantum computers, which have the potential to revolutionize computing by performing complex calculations much faster than traditional computers.
- **Fusion Energy:** Superconductors are being investigated as a potential solution for producing sustainable fusion energy, which involves merging atomic nuclei to release energy.
- **High-Speed Transportation Systems:** Superconductors are being explored as a potential solution for creating high-speed transportation systems, such as Maglev trains. Maglev trains use superconducting magnets to levitate and propel the train, resulting in faster and more efficient transportation.
- **Improved Energy Efficiency:** Superconductivity can be used to create more efficient power transmission cables, motors, and generators, resulting in less energy loss and lower operating costs.
- **Faster Computing:** Superconducting materials are being used to develop quantum computers that can perform complex calculations much faster than traditional computers.
- **Sustainable Energy:** Superconductors are being investigated as a potential solution for producing sustainable fusion energy, which involves merging atomic nuclei to release energy.

### Superconductivity-Indian Scenario

- India has a long history of research in superconductivity, with notable contributions from institutions such as the Tata Institute of Fundamental Research (TIFR) and the Indian Institute of Technology (IIT) Bombay.
- **The National Superconductivity Mission (NSM)** is an initiative launched by the Government of India in 2017 to promote research and development in the field of superconductivity.
- The mission aims to develop indigenous technology for superconductors and their applications in various industries, including healthcare, energy, and transportation.

### Conclusion

- Superconductivity offers exciting opportunities for various fields, but there are still challenges that need to be overcome before it can be widely adopted. With ongoing research and development, it is possible that many of these challenges will be overcome, and superconductivity will become an essential component of modern technology.

## AN ORGANISED COUNTER TO ORGANISED HATE

### Context

- There needs to be an inspiring alternative agenda that enthuses India and which can move the silent majority away from the climate of hate

### Background

- The communal disturbances in Maharashtra, the performative religiosity in the new Parliament's inauguration and The Kerala Story are all intrinsic to the vitiating mass consciousness
- Such issues typically pit Hindus against Muslims, elite establishmentarians against grounded 'nationalists' and constitutional values against 'traditional' values.
- Despite this war's profound impact on India's social fabric, little attention has been devoted to analysing why atavistic tendencies acquire a social base. If most Indians live by the Ganga-Jamuni Tehzeeb, nothing could make them communal, xenophobic, casteist, patriarchal or racist.
- Yet, studies show that India has become radicalised and socially conservative. To reverse the flames engulfing India dissecting the black box of hate is critical.

### The anatomy of organised hate

- There are broadly three types of hatred today — organised, inherited and absorbed hate.
- The first is invariably for partisan ends. Inherited hate is generationally passed down (usually caste, communal and gender prejudices), which is fertile soil for the champions of organised hate. Finally, absorbed hate is a disease afflicting the silent majority.
- Progressive forces invariably counter the visible champions of organised hate, including party spokespersons, aligned influencers and organisations, as well as troll armies. They also resort to debunking misinformation or cornering regressive stances/action.
- Furthermore, their propaganda is complemented by a vast network of socio-cultural and religious organisations that subterranean spearhead ideological projects.

### Structurally combating hate

- Whole communities have shrivelled in the face of the hatred engulfing India. Given this, there are both moral and pragmatic considerations to frontally tackle the fear that breeds regressive attitudes.
- First, we progressives need to acknowledge pre-existing societal fears of losing out on economic and political opportunities, and redress them. Given this, progressives need to carefully assuage such fears. A first step could be posing an inspiring alternative agenda that enthuses India. Only then can we wean away the silent majority from the claws of hatred.
- Secondly, progressive parties also need to put boots on the ground. In that spirit, they must actively collaborate with civil society, which transcends electoral exigencies. Serving as a complementary system, this could become both a response mechanism to conflagrations, and a network of progressive ideological projects. This would facilitate the forging of fresh relationships with new constituencies.
- Furthermore, progressive parties can substantively constrict regressive activities when in office, as the recently elected Karnataka government is doing. Just to cite some obvious examples, organisations frequently showcase movies to vitiate public discourse, conduct processions and sansads to disrupt the peace. While states can ban such organisations, this is only a stopgap since they invariably remerge in a new avatar.
- Fourth, progressives also need to check benefactors of regressive causes. A conflagration is sometimes a smokescreen to promote narrow economic interests.

- Similarly, select diaspora groups support regressive projects for preferential treatment in commercial ventures in India. Mapping this financial infrastructure of hate would enable targeted counters using state instruments.

### Conclusion

- Today, more than ever, India needs an organised, programmatic and political counter to hate. We do not have the luxury to wait for an organic mass psychological realignment.

## FIBONACCI SEQUENCES AND ITS SIGNIFICANCE

### Context

- Fibonacci spirals are so common in plants today that they are believed to represent an ancient and highly conserved feature, dating back to the earliest stages of plant evolution and persisting in their present forms. But a new study, based on 407-million-year-old fossils, challenges this.

### About

- What ties all of these botanical features together is their shared characteristic of being arranged in spirals that adhere to a numerical sequence called the Fibonacci sequence.
- These spirals, referred to as Fibonacci spirals for simplicity, are extremely widespread in plants and have fascinated scientists from Leonardo da Vinci to Charles Darwin.
- Such is the prevalence of Fibonacci spirals in plants today that they are believed to represent an ancient and highly conserved feature, dating back to the earliest stages of plant evolution and persisting in their present forms.
- However, our new study challenges this viewpoint. Recently scientists examined the spirals in the leaves and reproductive structures of a fossilised plant dating back 407 million years and surprisingly discovered that all of the spirals observed in this particular species did not follow this same rule.
- Today, only a very few plants don't follow a Fibonacci pattern.

### Fibonacci spirals

- Spirals occur frequently in nature and can be seen in plant leaves, animal shells and even in the double helix of our DNA.
- In most cases, these spirals relate to the Fibonacci sequence – a set of numbers where each is the sum of the two numbers that precede it (1, 1, 2, 3, 5, 8, 13, 21 and so on).
- These patterns are particularly widespread in plants and can even be recognised with the naked eye.
- At first, you may only spot spirals in one direction. But look closely and you can see both clockwise and anticlockwise spirals.
- In a study that analysed 6,000 pinecones, Fibonacci spirals were found in 97% of the examined cones.
- Fibonacci spirals are not just found in pine cones. They are common in other plant organs such as leaves and flowers.
- Due to their frequency in living plant species, it has long been thought that Fibonacci spirals were ancient and highly conserved in all plants.
- However in a study it was found that non-Fibonacci spirals were the most common arrangement.
- The discovery of non-Fibonacci spirals in such an early fossil is surprising as they are very rare in living plant species today.

### Distinct evolutionary history

- These findings change our understanding of Fibonacci spirals in land plants.
- They suggest that non-Fibonacci spirals were ancient in clubmosses, overturning the view that all leafy plants started out growing leaves that followed the Fibonacci pattern.
- Furthermore, it suggests that leaf evolution and Fibonacci spirals in clubmosses had an evolutionary history distinct from other groups of living plants today, such as ferns, conifers and flowering plants.
- It suggests that Fibonacci spirals emerged separately multiple times throughout plant evolution.

## Conclusion

- Knowing of this study would help in the common understanding of plant evolution and its characteristics.

## LAYING THE FOUNDATION FOR A FUTURE-READY DIGITAL INDIA

### Context

- The proposed 'Digital India Bill' holds out the promise of not only upgrading the current legal regime but also redefining the contours of how technology is regulated.

### Background

- The Ministry of Electronics and IT has been actively organising consultations on the proposed "Digital India Bill" to build conceptual alignment on a new law that will replace India's 23-year-old Information Technology (IT) Act.
- The goal is to upgrade the current legal regime to tackle emerging challenges such as user harm, competition and misinformation in the digital space.
- This is a much-anticipated piece of legislation that is likely to redefine the contours of how technology is regulated, not just in India but also globally.

### The present regime

- The current IT Act defines an "intermediary" to include any entity between a user and the Internet, and the IT Rules sub-classify intermediaries into three main categories: "Social Media Intermediaries" (SMIs), "Significant Social Media Intermediaries" (SSMIs) and the recently notified, "Online Gaming Intermediaries".
- SMIs are platforms that facilitate communication and sharing of information between users, and SMIs that have a very large user base (above a specified threshold) are designated as SSMIs.
- However, the definition of SMIs is so broad that it can encompass a variety of services such as video communications, matrimonial websites, email and even online comment sections on websites.
- The rules also lay down stringent obligations for most intermediaries, such as a 72-hour timeline for responding to law enforcement asks and resolving 'content take down' requests.

### The lacunae

- Unfortunately, ISPs, websites, e-commerce platforms, and cloud services are all treated similarly.
- Treating these intermediaries like conventional social media platforms not only adds to their cost of doing business but also exposes them to greater liability without meaningfully reducing risks presented by the Internet.
- The European Union's Digital Services Act is probably one of the most developed frameworks for us to consider.
- It introduces some exemptions and creates three tiers of intermediaries — hosting services, online platforms and "very large online platforms", with increasing legal obligations.
- Australia has created an eight-fold classification system, with separate industry-drafted codes governing categories such as social media platforms and search engines.
- Intermediaries are required to conduct risk assessments, based on the potential for exposure to harmful content such as child sexual abuse material (CSAM) or terrorism.

### Focus areas for India

- While a granular, product-specific classification could improve accountability and safety online, such an approach may not be future-proof.
- As technology evolves, the specific categories we define today may not work in the future.
- What we need, therefore, is a classification framework that creates a few defined categories, requires intermediaries to undertake risk assessments and uses that information to bucket them into relevant categories.
- Given the lower risks, the obligations placed on intermediaries that are not communication services should be lesser, but they could still be required to appoint a grievance officer, cooperate with law enforcement, identify advertising, and take down problematic content within reasonable timelines.



- Intermediaries that offer communication services could be asked to undertake risk assessments based on the number of their active users, risk of harm and potential for virality of harmful content.
- The largest communication services (platforms such as Twitter) could then be required to adhere to special obligations such as appointing India-based officers and setting up in-house grievance appellate mechanisms with independent external stakeholders to increase confidence in the grievance process.
- Alternative approaches to curbing virality, such as circuit breakers to slow down content, could also be considered.

#### Way forward

- For the proposed approach to be effective, metrics for risk assessment and appropriate thresholds would have to be defined and reviewed on a periodic basis in consultation with industry.
- In doing so, it could help create a regulatory environment that helps achieve the government's policy goal of creating a safer Internet ecosystem, while also allowing businesses to thrive.

## MAHALA NOBIS IN THE ERA OF BIG DATA AND AI

### Introduction

- Professor P.C. Mahalanobis, who introduced statistics to India, is a scientist whose absence is felt dearly even today. Mahalanobis's lifelong courtship with statistics, his unwavering and fearless leadership to advance a statistics and survey culture in India, the founding of the Indian Statistical Institute — “a mighty monument of his handicraft” — and his nurturing of a generation of outstanding academicians have all left behind an enduring legacy.

### The age of Big Data

- Over the past 20 years, there has been a global shift in both the nature of data and statistics.
- With the advent of the Internet and virtually everything confined to the Internet of Things, there has been a flood of data, most of it junk.
- We now have much more data than what available technology can leverage. This is widely perceived as the era of Big Data.
- Another significant yet related issue is how artificial intelligence (AI) is transforming our lives and lifestyles.
- The state of society is precarious. One can wonder how Mahalanobis, a statistical doyen and a key figure in the early development of Indian democracy, would have responded to the Big Data-related craziness and the AI-driven revolution.
- Historically, data often appears to be Big when the available technology at that time fails to analyse it.
- Mahalanobis also encountered a Big Data problem when his large-scale surveys yielded lots of data that needed to be looked into for effective planning.
- To handle tons of data and tackle the complex mathematical calculations, Mahalanobis persuaded the government and succeeded in procuring the first two digital computers of the country (and South Asia, too) at his Indian Statistical Institute, in 1956 and 1958, and thus ushered in the age of computers in India.

### Problems during COVID-19

- Mahalanobis was “a physicist by training, a statistician by instinct and an economist by conviction”. He had an uncanny knack for embracing technology for human welfare, perhaps as a result of his background in physics.
- Thus, one may safely perceive that Mahalanobis would have embraced the power of AI in enhancing human productivity, such as Big Data analyses, and perhaps in a way that is far more effective than how AI is currently applied to that goal.
- One recent Big Data foible, for instance, involved numerous contradictory projections during the COVID-19 era.
- One could argue that if Mahalanobis was alive today, the country's COVID-19 response could have been much stronger.
- If he was in the lead, our data might be beyond question, and the analyses might be far more accurate.
- And India's “Plan Man” could be the best person for planning to build optimal health-related infrastructures for combating future disasters.

### AI regulation

- Around seven decades ago, from the perspective of the newly independent nation, planning — with the aid of extensive technocratic exercises with democratic participation — moved from the realm of politics, primarily due to Mahalanobis. Now, we are at the crossroads.
- India's upcoming census will be a digital exercise. The dynamics of other surveys are also bound to change in the new normal setup. That is how statistics is evolving. We would miss the leadership of an expert such as Mahalanobis from this changed statistical perspective.

### Conclusion

- As AI is threatening to replace millions of jobs without creating alternatives and is also aiding in spreading disinformation, there is a substantial global attempt to clip its wings.

## CHANDRAYAAN-3 TO BE LAUNCHED : CHANDRAYAAN-2 AND WHY IT PARTIALLY FAILED

### Context

- Almost four years after its first unsuccessful attempt to make a spacecraft land on the Moon, Isro will launch its third moon mission, Chandrayaan-3 (Ch-3), on July 12, with the primary objective of executing a precise landing on the celestial body.
- In 2019, the lander and rover of the Chandrayaan-2 mission malfunctioned in the final moments and crash-landed, getting destroyed in the process.
- The Chandrayaan-2 mission was launched on July 22, 2019,
- Vikram lunar lander crashed on the Moon during the early hours. Its debris was later found by NASA around three months later.
- Despite the setback, the mission wasn't a complete failure as its Orbiter part kept on working normally and gathered a wealth of new information that added to our knowledge about the Moon and its environment.

### What was the Chandrayaan-2 mission?

- Although the most talked about objective of the Chandrayaan-2 was to demonstrate the ability to soft-land a lander and rover on the unexplored south pole of the Moon, it also had other goals.
- The mission was "designed to expand the lunar scientific knowledge through a detailed study of topography, seismography, mineral identification and distribution, surface chemical composition, thermo-physical characteristics of topsoil and composition of the tenuous lunar atmosphere, leading to a new understanding of the origin and evolution of the Moon.
- As in 2021, the space agency revealed that the mission's Orbiter had produced a handsome amount of data about the Moon.
- This helped in building upon existing knowledge of the celestial body in terms of its surface, sub-surface and exosphere.
- For instance, a key outcome from Chandrayaan-2 was the exploration of the permanently shadowed regions as well as craters and boulders underneath the regolith, the loose deposit comprising the top surface extending up to 3-4m in depth.

### What went wrong with the Chandrayaan-2's Vikram lander?

- The landing of Vikram was targeted for a plane about 600 km from the south pole of the Moon. However, ISRO lost contact with their lander shortly before the scheduled touchdown on September 7.
- When contact was lost, it was travelling at 50 to 60 metres per second (180 to 200 km per hour). It was decelerating, but not fast enough to slow down to a speed of 2 metres/second (7.2 km/hr) that was required for a safe landing.
- As Vikram was designed to absorb the shock of an impact even at 5 metres/second (18 km/hr). At the rate it was decelerating, it could not even have attained a speed of 5 metres/second before touchdown. It hit the Moon at a far greater speed, damaging itself and the instruments on board.

### About Chandrayaan-3 Mission:

- Chandrayaan-3 is a follow-on mission to Chandrayaan-2 to demonstrate end-to-end capability in safe landing and roving on the lunar surface. It consists of Lander and Rover configuration. It will be launched by LVM3 from SDSC SHAR, Sriharikota.
- Lander payloads:

- Radio Anatomy of Moon Bound Hypersensitive ionosphere and Atmosphere (RAMBHA)
- Chandra's Surface Thermo physical Experiment (ChaSTE)
- Instrument for Lunar Seismic Activity (ILSA)
- Laser Retroreflector Array (LRA) Rover:
- Alpha Particle X-Ray Spectrometer (APXS)
- Laser Induced Breakdown Spectroscope (LIBS) Propulsion Module:
- Spectro-polarimetry of HABitable Planet Earth (SHAPE)
- The mission objectives of Chandrayaan-3 are:
- To demonstrate Safe and Soft Landing on Lunar Surface
- To demonstrate Rover roving on the moon and
- To conduct in-situ scientific experiments

**Chandrayaan-3, a way forward to Chandrayaan-2 Mission:**

- The most obvious miss was the opportunity to demonstrate the technology to make a soft landing in outer space.
- Isro scientists at the time said the accident was caused by a relatively small error that had been identified and corrected. The soon-to-be-launched Chandrayaan-3 mission will demonstrate this technology, hopefully, without any glitches.
- The lander Vikram and rover Pragyaan were carrying instruments to carry out observations on the surface. These were supposed to pick up additional information about the terrain, composition and mineralogy.
- With the support of the Orbiter, Vikram and Pragyaan would have provided two diverse sets of data that could have helped prepare a more composite picture of the Moon.

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## ENVIRONMENT

### CLIMATE BREAKDOWN: THE ARCTIC OCEAN COULD ICE-FREE THE 2030s

#### Context

- The Arctic Ocean could be ice-free in summer by the 2030s, even if we do a good job of reducing emissions between now and then. That's the worrying conclusion of a new study in Nature Communications.

#### The background

- Predictions of an ice-free Arctic Ocean have a long and complicated history, and the 2030s is sooner than most scientists had thought possible.
- The Arctic has been experiencing climate heating faster than any other part of the planet.
- As it is at the frontline of climate change, the eyes of many scientists and local indigenous people have been on the sea ice that covers much of the Arctic Ocean in winter.
- This thin film of frozen seawater expands and contracts with the seasons, reaching a minimum area in September each year.
- The ice which remains at the end of summer is called multiyear sea ice and is considerably thicker than its seasonal counterpart. It acts as barrier to the transfer of both moisture and heat between the ocean and atmosphere.
- Over the past 40 years this multiyear sea ice has shrunk from around 7 million sq. km to 4 million.
- That is a loss equivalent to roughly the size of India or 12 UKs. In other words, it's a big signal, one of the most stark and dramatic signs of fundamental change to the climate system anywhere in the world.

#### Blue Ocean Event (BOE)

- A Blue Ocean Event (BOE) is probably something you've never heard of, but in just a few years it will be the biggest story that everyone is talking about.
- A BOE is when the Arctic Ocean changes from being covered in ice year-round and reflecting most of the sunlight that impacts it back into space to being mostly ice-free blue water for a period of time during the warm season (May through October), which will cause it to absorb most of the sunlight that impacts it.
- Once a BOE occurs during a warm season, the Arctic Ocean water will refreeze during the following cold season.
- However, since the water will be slightly warmer each year, longer Blue Ocean Events are expected with each passing warm season, causing extensive impacts to the global climate and human habitat.
- Blue water, which is dark, absorbs more sunlight than white ice, due to the fact that darker colors naturally absorb more sunlight than lighter colors, a phenomenon known as the "albedo effect."
- One problem with predicting when this might occur is that sea ice is notoriously difficult to model because it is influenced by both atmospheric and oceanic circulation as well as the flow of heat between these two parts of the climate system.

#### The Consequences

- There is still plenty of uncertainty around the exact date – about 20 years or so– because of natural chaotic fluctuations in the climate system. But compared to previous research, the new study still brings forward the most likely timing of a blue ocean event by about a decade.
- Arctic sea ice is an important component of the climate system. As it dramatically reduces the amount of sunlight absorbed by the ocean, removing this ice is predicted to further accelerate warming, through a process known as a positive feedback.
- This, in turn, will make the Greenland ice sheet melt faster, which is already a major contributor to-sea level rise.
- The loss of sea ice in summer would also mean changes in atmospheric circulation and storm tracks, and fundamental shifts in ocean biological activity.

#### Way forward

- In conclusion, temperatures could rise strongly by 2026, resulting in humans going extinct, making it in many respects rather futile to speculate about what will happen beyond 2026.
- On the other hand, the right thing to do is to help avoid the worst things from happening, through comprehensive and effective action through a Climate Plan.

## WHAT IS THE NEW COLLECTIVE QUANTIFIED GOAL?

### Introduction

- The recently-concluded **Bonn climate conference** in Germany, expected to outline the political agenda for the crucial end-of-year **Conference of Parties-28 (COP28)** in Dubai, was critical for reviewing and reforming the climate finance architecture. The conference has exposed a gaping hole in the funding needed to pay for climate action. This comes from a long-standing impasse between developed and developing countries, over where money for climate change policies should come from and in what form.

### Defining New Collective Quantified Goal (NCQG)

- A commitment of '\$100 billion per year till 2020' to developing nations from developed countries was a target set at the Conference of Parties (COP) in 2009.
- But estimates since then show addressing climate change may cost billions, and even, trillions of dollars. Therefore, the 2015 Paris Climate Agreement agreed on setting a New Collective Quantified Goal (NCQG) for climate financing prior to 2025
- The NCQG is thus, termed the "most important climate goal". It pulls up the ceiling on commitment from developed countries, is supposed to anchor the evolving needs and priorities of developing countries based on scientific evidence.

### Need of a new finance goal

- Out of the promised \$100 billion per year, developed countries provided \$83.3 billion in 2020, as per a report by the **Organisation for Economic Co-operation and Development**.
- These figures may be misleading and inflated by as much as 225%.
- Moreover, the \$100 billion target set in 2009 was seen more as a political goal, since there was no effort to clarify the definition or source of 'climate finance'.
- The economic growth of developed countries has come at the cost of high carbon emissions, and thus they are obligated to shoulder greater responsibility.
- While funds available for climate finance have quantitatively increased, they are inaccessible, privately sourced, delayed and not reaching countries in need.
- Countries most in need of finances have to wait years to access money and pay interest high rates, thus increasing their debt burden.

### Developed countries stand-

- Wealthy nations want to expand the donor base with NCQG. This would facilitate global contributions.
- The **European Union** is calling for global efforts instead of contributions merely coming from developed countries.
- The **Environmental Integrity Group (EIG)**, a negotiation group comprising six nations including Switzerland, said other elements framed as "technical" by developing countries are highly political.

### Developing countries stand-

- Negotiators from Antigua and Barbuda said that technical negotiators don't have the mandate to "expand donor base".
- Alliance of Small Island States, an intergovernmental organisation of low-lying coastal and small island countries, said broadening the donor base is a political topic.
- South Africa, on behalf of the African Group of Negotiators also opposed the expansion of the donor base.

### Conclusion

- Countries are on a tight deadline to agree upon the NCQG ahead of 2024.
- There's no official number yet, but a global transition to a low-carbon economy requires investments of at least \$4 trillion to \$6 trillion a year, as per last year's Sharm el-Sheikh Implementation Plan.
- Some argue that instead of identifying a single aggregate figure, the NCQG could also set separate targets (or sub-goals) for focus areas such as mitigation, adaptation and loss and damage.

- The aim is to focus on scaling up concessional financing, stopping debt creation and allowing NCQG to be more of a “**process**” rather than a goal towards equitable and people-led transition.





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