

- **UNGA** by a resolution 74/212 of 22nd Jan 2020, designated the Day to emphasize the need to make further efforts to improve air quality, including reducing air pollution, to protect human health.
- **On 7th Sep 2023**, the 4th International Day of Clean Air for blue skies focused on the theme, '**Together for Clean Air**'. The theme aims to highlight the urgent need for stronger partnerships, increased investment, and shared responsibility of overcoming pollution.

3. PRELIMS FACTS

1) CULTURE: POILA BAISAKH (POHELA BAISAKH)

- It is the first day of the Bengali Calendar which is also the inspiration for official calendar of BD. It is celebrated on 15th April in India in the states of WB, Tripura, Jharkhand, and Assam (Barak Valley) by Bengalis regardless of religious faith.
- It is celebrated with processions, fairs and family times.
 - In 2016, the UNESCO declared this festivity organized by the Faculty of Fine Arts, University of Dhaka as a cultural heritage of humanity.
- **West Bengal Assembly** has passed a resolution on 'Poila Baisakh' as State Foundation Day (or Bangla Divas) (Sep 2023)
 - **Background Controversy:** A controversy had emerged when Raj Bhavan had observed June 20, as the Foundation Day.
 - **Chief Minister Mamta Banerjee** has criticized this in the assembly saying that there was no particular day which was observed as the State Foundation Day and June 20 which brings back the memories of partition has nothing to do with Foundation of the state.
- **Resolution on making Tagore's 'Banglar Mati Banglar Jol'** (Bengal's soil and Bengal's water) as the official song of West Bengal was also passed by the assembly.

2) CULTURE: LANGUAGE: KOKBOROK

- **Why in news?**
 - Protests and strikes in Tripura by Twipra Students' Federation (TSF) to press for the introduction of Roman script for Kokborok, state's indigenous lingua franca, and other demands (Sep 2023)
- **About Kokborok language:**
 - Kokborok (or Tripuri) is a Tibeto Burman language of the Indian State of Tripura and neighbouring areas of Bangladesh. Its name comes from Kok meaning "verbal" and borok meaning people of "human". The language was formerly called Tripuri & Tipra Kok, with its name being changed in the 20th century. It has been attested since at least 1st century CE, when the historical record of Tripuri kings began to be written.
 - It was originally written using Koloma script.
 - **Official Language:** It is an official language of the state since 1979. Consequently, the language has been taught in schools of Tripura from the primary level to the higher secondary stage since 1980s. Now it also has BA and MA courses.
 - **Demand for inclusion in 8th Schedule** of the Constitution of India is also going on.
- **Script and Associated issues:**
 - The language had a script called Koloma script that was developed in 1st century CE and used by the Royal family of Tripura. But the script fell out of use in the 14th century, and is widely considered to have been lost.
 - **From the 19th century**, **Bengali script** is being used to write the Kokborok. But since the independence, several NGOs have been promoting **Roman Script**.
 - **The script issue has become highly politicized presently**.

- The Left front government advocate usage of the Asian Bengali script and all the regional indigenous parties and student organization and ethnic nationalist organizations advocate for Roman Script.

- **Why the protests recently?**

- In 2022, the Opposition TIPRA Motha party flagged media reports where candidates were claimed to have been compelled by exam invigilators to write answers of the Kokborok paper in Bengali script. The demand for introducing Roman script has intensified since then.

3) INFRASTRUCTURE: NYOMA AIRFIELD

Defence Minister Rajnath Singh laid down foundation stone for Nyoma airfield in **Eastern Ladakh very close to LAC** in Sep 2023

It will be developed at a cost of Rs 200 crore and will boost air infrastructure in Ladakh and augment the IAF's capability along the northern border. It will be one of the world's highest airfield and prove game changer for the armed forces.

It will be completed in about two years and will be able to accommodate all fighter jets in the IAF's inventory.



4) INFRASTRUCTURE: NECHIPHU TUNNEL

In Sep 2023, Defence Minister Rajnath Singh inaugurated the crucial Nechiphu tunnel on the axis to Tawang in Arunachal Pradesh.

It is a 500-meter tunnel on Balipara-Charduar-Tawang Road. The work for this started in 2020.

This tunnel, along with Sela tunnel, which is under construction, will provide all weather connectivity to the strategic Tawang Region.

Strategic Significance: Defence experts say that it will play an important role in neutralizing any threat from China.

Economic Significance: More tourism



5) INFRASTRUCTURE: SELA PASS TUNNEL

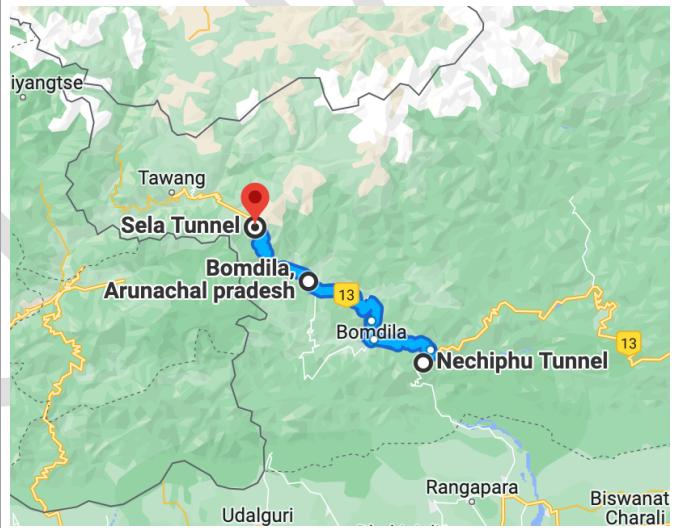
About Sela Pass

- It is high altitude mountain pass located on the border between the Twang and West Kameng Districts of Arunachal Pradesh.
- It has an elevation of 4170 m (around 13,000 feet), and connects Tibetan Buddhist town of Tawang to Dirang (West Kameng District) and Guwhati i.e. the pass carries the main road connecting Tawang with the rest of India.
- Sela Lake is one of the approximate 101 lakes in the area that are sacred in Tibetan Buddhism.



About the Tunnel

- It is being constructed by BRO at a cost of Rs 687 crores. It is being constructed using the latest New Australian Tunneling Method (NATM) and is much below the snowline allowing all weather travel challenges without the challenge of snow clearance.
- At this height, it will be the world's longest bi-lane road tunnel. It would provide all weather connectivity to Tawang.



Significance

- **Strategic:** the tunnel will reduce the travel time between the Indian Army's 4 Corps headquarters at Tezpur in Assam and Tawang.
- **Economic:** it will also boost the tourism industry in the region.

6) S&T: SHANTI SWARUP BHATNAGAR PRIZE (SSB PRIZE)

- Why in news?
 - After Year's delay, CSIR's Bhatnagar award for 2022 announced (Sep 2023)
- About Shanti Swarup Bhatnagar Prize
 - Shanti Swarup Bhatnagar Prize for Science and Technology is a prestigious honour and an annual award in science and technology in India.
 - It is awarded by CSIR and its named after its founder director Dr. Shanti Swarup Bhatnagar.
 - The award recognizes outstanding contributions in the field of biological sciences, Physical Sciences, Mathematical Sciences, Chemical Sciences, Engineering Sciences, Medical Sciences and Earth, Atmosphere, Ocean and Planetary Sciences.
 - It is announced each year on 26th Sep to mark the CSIR foundation day.
 - It contains a citation, a plaque, a cash award of Rs 5 Lakh and an endowment of Rs 15,000 per month up to the age of 65 years.

- **About Shanti Swarup Bhatnagar**
 - Shanti Swarup Bhatnagar (1894 - 1955) was an Indian scientist, academic and scientific administrator. He was the first Director General of CSIR and the first chairperson of UGC.
 - The Shanti Swarup Bhatnagar Price was initiated by CSIR in 1958 in his honour.
- **About 2022 Award** (Announced in Sep 2023)
 - The 2022 Bhatnagar prize honours 12 scientists across seven scientific discipline.
 - While the award is usually announced on Sep 26 - CSIR's Foundation day - the prizes weren't announced last year, without any official reason being ascribed.
 - Last year, the Ministry of Home Affairs constituted a committee to review all the national awards administered by various science and medical ministries and whittled down some of them. The **SSB** award however was retained.

7) S&T: CYBER SECURITY: C-DOT

- **Why in news?**
 - C-DOT celebrates its 40th Foundation Day (25th Aug 2023)
- Centre for Development of Telematics (C-DOT) was established in 1984 as an autonomous Telecom R&D centre of DoT, Gol. It is a registered society under the Societies Registration Act, 1860.
- It is chaired by Ministry of Communication and Information Technology.
- It is a registered public funded research institute with the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology.
- **Key contribution:**
 - In its initial years, it triggered the telecom boom in the rural India that was responsible for all around socio-economic development.
 - As part of its development process, it also spawned a wide base of equipment manufacturers and component vendors for the industry.
- Over the years it has evolved into full-fledged telecom R&D institution, that complies with level-5 maturity on CMMI Model and has capabilities to undertake large-scale state of art telecom technologies development programs.
- C-DOT as a torch bearer of indigenous telecom R&D continues to develop latest technology products in areas like Optical, Switching, Wireless, Security and Network Management while also working on futuristic technologies like M2M/IOT, 5G, AI etc.
- It also works towards realizing the objectives of various flagship programs of the Government of India that include Digital India, Make In India, Skill India, Startup India, and Smart Cities.

8) S&T: CYBER SECURITY: TRINETRA – ENTERPRISE SECURITY OPERATION CENTRE

- Ministry of communication and information technology has launched TRINETRA on 25th August 2023.
- It is aimed at providing end-to-end security solution to the organizations for detection, analysis and mitigation of cyber security threats.
- It is a combination of multiple security systems like Security Information and Event Management (SIEM), Security Orchestration and Automated Response (SOAR), Data Loss prevention etc.
- It provides 24X7 near real-time actionable cyber security status and detection and resolution of cyber threats (Virus, Malware, Ransomware, Spyware etc.)

- It also performs security evaluation of organization's IT assets by protecting endpoints including PC, Laptop, Servers and VMs by detection, analyses, and mitigation of vulnerabilities and giving AI enabled automated responses to the cyber threats ensuring protection of sensitive data.

9) DEFENCE: C-295 TRANSPORT AIRCRAFT

- **Why in news?**
 - IAF chief takes delivery of the first C-295 transport aircraft in Spain (Sep 2023)
- **About the Aircraft:**
 - Note: India has ordered 56 C-295Ws for the Indian Air Force, with a plan to order an additional 6 aircrafts for the Indian Coast Guard and 9 aircraft for the Indian Navy.
- **Details**
 - The aircraft comes in transport configuration, equipped with an Indian Electronic Warfare Suite.
 - In Sep 2021, the Defence Ministry signed a Rs 22,000 crore deal with Airbus and Space S.A., Spain for procurement of 56 C-295s.
 - **Total 56 Aircrafts are to be procured by Indian Airforce:**
 - 16 aircraft will come in a fly-away condition from Seville, while 40 will be manufactured by Airbus jointly with Tata Advanced System Limited (TASL).
 - Work is underway to set up the Final Assembly Line (FAL) at Vadodara in Gujarat and the first aircraft manufactured in India would be delivered in Sep 2026.
 - **Need:** Replacing 56 Avro Transport Aircraft: IAF has 56 Avro Transport aircraft procured in the 1960s and they are in urgent need of the replacement.

10) DEFENCE: VARUNA 2023

Exercise Varuna	India France	Navy Phase-II of the <u>21st edition of Varuna (Varuna-23)</u> , between Indian and French Navy was conducted in Arabian Sea in Sep 2023. The exercise was conducted over three days and witnessed joint operations, underway replenishment and various tactical maneuvers.	Indian & French Navy bilateral exercise was initiated in <u>1993</u> . The exercise was later christened as ' <u>Varuna</u> ' in <u>2001</u> and has since become a hallmark of robust India-France Strategic bilateral relationship. It is aimed at <u>enhancing cooperation and interoperability</u> of two navies.
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PRE-CUM-MAINS 2024

SEP 2023 : BOOKLET-3

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Optional DAMP 2024

DAILY ANSWER WRITING & MENTORSHIP PROGRAM

**SOCIOLOGY**

By Nishat Sir

**HISTORY**By Nikhil Sir
& Vishal Sir**PHILOSOPHY**By Vishwajeet Sir
(EX - IAAS)**PSIR**

By Chandan Sir

**ANTHRO**

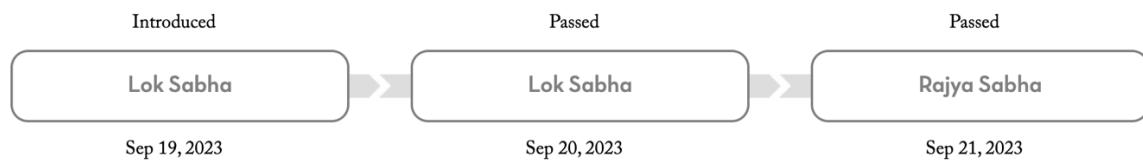
By Karandeep Sir

Admissions*Open***8826486658****8826496658****Office Complex 6, Third Floor Old****Rajinder Nagar, New Delhi-110060**

1. GENERAL STUDIES-2

1) PARLIAMENT: RESERVATION FOR WOMEN

- Why in news?
 - » Women's Reservation Bill 2023 [The Constitution (128th Amendment) Bill, 2023] passed in both houses of Parliament (Sep 2023)



- Background:
 - » Even though the **2019 Lok Sabha elections** saw the highest ever presence of women in parliament, it still stands at **78 (14.39%) among 543 seats**. This percentage is well below the global average (24.6%) showing that in India gender discrimination is quite prevalent even in case of elections to the top positions in the country. At **state assemblies' level** this performance is more dismal with only **9% seats being filled by women**.
- Previous efforts to provide reservation for women in legislative bodies:
 - » Bills amending the Constitution to reserve seats for women in Parliament and State Assemblies have been introduced in 1996, 1998, 1999, and 2008. The first three lapsed due to dissolution of their respective Lok Sabhas. The 2008 bill was introduced in RS and passed in RS in 2010, but it also lapsed with the dissolution of 15th LS.
- In 2015, the Report on the Status of Women in India noted that the representation of women in state assemblies and Parliament continues to be dismal.
 - » **Decision making positions in political parties** have negligible presence of women.
 - » It recommended reserving atleast 50% seats for women in local bodies, state assemblies, Parliament, ministerial levels, and all decision-making bodies of the government.
- The **National Policy for the Empowerment of Women (2001)** had stated that reservation will be considered in higher legislative bodies.
- The Constitution (128th Amendment) Bill, 2023: (Naari Shakti Vandana Adhiniyam)
 - » **Reservation:** The bill reserves, as nearly as possible, **1/3rd of the seats** for women in LS (insertion of Article **330A**), State Legislative Assemblies (insertion of article **332A**), and the LA of NCT of Delhi (amendment to article 239AA). This will also apply to seats reserved for SCs and STs in Lok Sabha and State legislatures.
 - » **Commencement of Reservation** (insertion of article 334A): This reservation will be effective after the census is conducted after the commencement of this bill has been published. Based on Census, **delimitation will be undertaken to reserve seats for women**. This reservation will be provided for **15 years**. However, this reservation will continue till such date as Parliament determines by a law.
 - » **Rotation of Seats (Article 334A):** Seats reserved for women will be rotated after each delimitation, as determined by a law made by Parliament.

- **Arguments in support of reservation for women in Representative Institutions**

1. **Gender Equality: Ending Discrimination against women.**

- India has signed the **International Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)** adopted in 1979 by the UNGA.
- The Convention provides the basis for realizing equality between women and men through ensuring women's equal access to, and equal opportunities in, political and public life -- including the right to vote and stand for elections - as well as education, health and employment.
- But female representation in Indian legislative bodies is below global average in India. Our legislative bodies don't reflect the contemporary trends in women's education and excellence in varied field and thus are facing credibility crisis.

2. **Social Justice**

- Social justice generally refers to the idea of creating a society or institution that is based on the principles of equality and solidarity, that understands the value of human rights, and that recognizes the dignity of every human being.

3. **Change the Social Structure of India in many ways** - Women at leadership roles will have various other positive social impacts.

4. **Women reservation have been quite successful at PRI level.**

- A 2003 study about the effect of reservation for women in Panchayats showed that women elected under the reservation policy invest more in public goods closely linked to women's concern.

5. **Better decision making because of diversity of thought.**

- Priorities and assumptions of policies and legislations are affected because of the poor participation of the other gender.
- Women issues are generally ignored because of men's lack of empathy and understanding of the issue.

6. Women will be able to **empathize with other struggles** in a better way.

- Women who have got their rights after long struggles will empathize with other struggles better.

7. **Reduce Crime and Corruption**

- Statistically, currently women legislators seems to be less probable to be involved in a criminal activity or corruption cases when compared to men.

- **Criticism of giving reservation to women:**

1. **Perpetuating Gender Inequality**

- It would perpetuate the unequal status of women since they wouldn't be perceived to be competing on merit.

2. **Diverts attention from more important electoral reforms.**

- Criminalization of politics

- Inner Party Democracy
 - 3. **Restricts choice of voters to women candidate**
 - A better option would be reservation in political parties and dual membership constituencies.
 - 4. **Rotation reduces incentive to work for constituency.**
 - 5. **Only promote family member of current politicians ; Quota will be appropriated by Stand-ins.**
 - Of all the women in Lok Sabha, around 70% already have other relatives in politics. This fact perhaps shows that women reservation will not be able to improve the "real" representation of women and only family members of some politicians whose seat becomes reserved will be elected from the seat.
- **Other Criticism of the Bill:**
- » **Why the reservation not brought into force immediately?**
- **Way Forward:**
- » **Capacity enhancement and training** for women politicians and representation.
 - » **User of gender-neutral terms in Parliamentary and government communications** (such as 'Chairperson' instead of chairman for RS chairperson)
 - Patriarchal terms reinforce gender biases and stereotypes against women and transgenders.
 - » **Steps to ensure that women's representation go to around 50%** even without the need of reservation:
 - **Genuine women empowerment** in all sectors right from school education, health and Higher Education.
 - **Addressing Gender based violence and harassment** and making public spaces safe and secure for everyone (including women)
 - **Focus on intra-party democracy** to ensure more women participants.
- **Conclusion:**
- » Almost unanimous passage of the **Naari Shakti Vandana Adhiniyam** is a testament to an irreversible force of social change - it will extend beyond the legislature to we, the people.

2) HEALTH: NIPAH VIRUS AND ZOONOTIC DISEASES

A) NIPAH VIRUS

- **Why in news?**
 - » There has been an outbreak of the deadly Nipah virus in Kerala which have infected five people and killed two of them (Sep 2023)
- **Introduction**
 - » According to WHO Nipah Virus (NiV) infection is a **newly emerging zoonosis** (a disease that can be transmitted from animals to humans) that can infect both humans and animals.
 - It is classified as a "**highly pathogenic paramyxovirus**" and handling it requires the highest grade of facilities called BS-4.

- » The natural host of the virus are **fruit bats** of the Pteropodidae family, Pteropus genus. Humans are generally infected by fruit bat or pigs. Human to human transmission is also known including in the hospital setting.
- **First identification**
 - » First identified during the outbreak of disease that took place in Kampung Sungai Nipah, Malaysia in 1998. In this case pigs were intermediate hosts. Since, then there have been several outbreaks even without intermediate hosts.
 - » In India it was first detected in Siliguri in 2001 and Nadia in 2007. This was a spillover of the outbreak in Bangladesh.
 - » Later in 2018, 19, 21 and again in 2023 it appeared in Kerala.
 - **Why?**
 - Kerala has several fruit plantations that host several species of bats.
 - Better health facilities in Kerala may be leading to better detection, surveillance etc., whereas in other states the cases may go undetected.
 - Note: In 2018, 21 and 2023, the outbreak occurred in Kozhikode district and in 2019 the outbreak was in Ernakulam district.
 - **Why only in these districts?**
 - Not clear. A 2021 study have found that Nipah virus as found to be in circulation in fruit bats in "many districts" in Kerala.
 - An ongoing national survey in 14 states by NIV Pune found NIPAH virus antibody in 9 states, including Kerala, and the UT of Puducherry.
- **Symptoms** of NiV can be **neurological, respiratory and pulmonary**. They include:
 - i. **Encephalitis (brain swelling) due to Inflammation of the brain**
 - ii. Confusion, disorientation and even persistent drowsiness
 - iii. Headache, fever, nausea and dizziness (flu like symptoms)
- **Fatality:** Around 40-70% depending on the local capability for epidemiological surveillance and clinical management.
- **Prevention** (Avoid date palm sap; avoid close contact with NiV Patient; avoid direct contact with pigs/bats in endemic area)
- **Treatment / Vaccine**
 - » **Intensive Support care (no treatment or vaccine is available)**
 - » According to NCDC (National Centre for Disease Control), Ribavirin, an antiviral, may have a role in reducing mortality among patients with encephalitis caused by NIPAH virus disease.

B) WHY ZOONOTIC DISEASES ARE FAST SPREADING TO HUMANS

- **Example Questions**
 - » "The diseases currently associated with forests (zoonotic diseases) can, in several ways be seen as a reaction to change in the relationship between humans and forests" Elaborate [10 marks, 150 words]
- **Introduction**

- » According to WHO, more than 300 zoonotic diseases have been observed over the past 70 years. It constitute about 60% of all human diseases and 75% of all the Emerging Infectious diseases. The last decade has been worst and have caught the humans unprepared. Some recent examples are that of Ebola, Zika, Nipah, Kyasanur Forest disease, COVID-19 etc.
- **Why increase in zoonotic diseases?**
 - » **Dramatic increase in population and mobility** -> Environmental changes , Deforestation etc.
-> increase human contact with pathogens.
 - » **Increased demand for animal protein**
 - Livestock production is moving closer to towns in the form of poultry farms etc.
 - » **Rise in intense and unsustainable farming**
 - » **Increased use and exploitation of wildlife**
 - » **Unsustainable utilization of natural resources**
 - » **Many Indian villages are located within or around forests**
 - Thus, significant number of people interact with forests in their day-to-day lives
 - » **Global Warming**
 - Increases the population of insects like ticks that harbour and transfer the virus
 - » **Poor Preparation in terms of infra and human resource**
 - Zoonotic diseases become more problematic in countries where health infrastructure is poor (e.g. Ebola in Africa, Zika in South America, Nipah in Asia etc.)
 - » **Lack of awareness** especially in rural areas also
- **Implications**
 - » **Health**
 - » **Economic losses**
 - Death of farm/domesticated animals etc.
 - Negatively hampers tourism of the region.
- **Way forward: How to deal with increasing infectious zoonotic diseases**
 - » Coping with unprecedented rise in the risk of pandemics and epidemics requires a **holistic approach to medicine that treats human health as part of environmental health**. We need to be more proactive in restoring wildlife health.
 - There is a need of closer monitoring and research into how increasing ecological footprint of humans is affecting health and disease dynamics.
 - **Operationalising the One Health approach** in land-use and sustainable development planning, implementation and monitoring, among other fields.
 - » Further, there is a need to increase R&D, improve awareness and better health infrastructure facilities to deal with rising cases of zoonotic diseases.
 - » **Incentivize sustainable land management** practices and developing alternatives for food security and livelihoods that don't rely on the destruction of habitats and biodiversity.
 - » **Improving biosecurity and control**, identifying key drivers of emerging diseases in animal husbandry and encouraging proven management and zoonotic disease control measures;
 - » **Strengthening capacities among health stakeholders** in all countries;

3) HEALTH: NON-COMMUNICABLE DISEASES

- **Example Questions**
 - » For long NCDs in rural India have been ignored. Suggest some measures to deal with increasing cases of non-communicable diseases in rural areas. [10 marks, 150 words]
 - » Non-Communicable diseases have become the biggest cause of deaths in India. Discuss the key causes and consequences of increasing non-communicable diseases in India. [10 marks, 150 words]
- **Introduction**
 - » Non communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are a result of a combination of genetic, physiological, environmental and behaviour factors.
 - » There are 4 main types of non-communicable disease are:
 1. **Cardiovascular diseases** (like heart attacks and strokes)
 2. **Cancers**
 3. **Chronic Respiratory diseases** (like chronic obstructed pulmonary disease and asthma)
 4. **Diabetes**
- Earlier, mostly elderlies in urban areas were found to be suffering from NCDs. But, now all age groups in all regions (both urban and rural) are increasingly becoming vulnerable to the non-communicable diseases.
- **Key Factors Responsible for increasing NCDs**
 - » **Modifiable Behavioural factors** such as tobacco use, physical inactivity, unhealthy diet etc.
 - » **Malnourishment**
 - Malnourishment makes children vulnerable to NCDs in later phase of life and is one of the major causes of NCDs in India.
 - » **Pollution** has emerged as a major challenge
 - Ambient **air pollution** and **indoor air pollution** have an impact on CVD and mortality. Various studies have shown that household pollution is the third top risk factor in low income countries.
 - » **Increasing Life Expectancy**
 - Life expectancy is increasing in India and with it we see an increase in old age population who are more vulnerable to NCDs like high blood pressure, diabetes and cancers.
 - » **Inadequate health facilities**
 - It prevents early screening, detection and thus awareness generation about NCDs.
- **NCDs are increasing in Rural India too:**
 - » **NCDS in Rural India is affecting a relatively younger population**
 - May be, because of poor nutrition availability during early life. So, there is a need to screen younger population in rural India for chronic diseases
 - » **Very Less awareness**
 - This hinders lifestyle changes and preventive methods.
 - » **Poor health facilities**
 - In rural areas, on many occasions facilities for diagnosis and treatment are not available resulting in late diagnosis and treatment.
 - » **Lack of systematic mechanism to collect data on NCDs from rural India**

- This hinders efforts at measuring the problem, guiding interventions and monitoring them effectively.

- Impact of NCDs

» Largest Cause of Death

- According to WHO, nearly 61% (63% globally) of all deaths in India are caused by NCDs including heart disorders, cancer and diabetes. According to MoH&FW cancer alone causes more than 5 Lakh deaths in India every year.

» Socio-Economic Impact

- **NCDs worsens Poverty:**
 - It threatens fight against poverty reduction and hinders achievement of SDGs.
 - This also burdens government with more health expenditure and reduces economic output of the population.
 - It also leads to **heavy burden on India's healthcare system.**

» International Image -> India's soft power weakens

- It questions a rising superpowers ability to tackle health problems of its own.

- Some Recent Steps taken by India

i. National Health Policy, 2017

- It aims at reducing premature mortality from cardiovascular diseases, cancers, diabetes, or chronic respiratory diseases by 25% by 2025.
- The policy recognizes inter-play of three actions -> Policy & Surveillance, Strengthening of Healthcare systems, and Healthcare Financing.

ii. National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Strokes (NPCDCS)

- Program by MoH&FW, launched in 2008
- It is focused on health promotion for general population and Disease Prevention for the High Risk Groups

iii. India Hypertension Management Initiative (IHMI)

- Launched in Nov, 2017 as a collaborative project between ICMR, MoH&FW, State governments, WHO etc
- It is aimed at strengthening the cardio-vascular disease component of the health ministry's National Program for Control of Cancer, Diabetes, Cardiovascular diseases and Stroke (NPCDCS).

iv. 1.5 lakh health and wellness centres to be established throughout the country

- These health and wellness centres will promote early screening, diagnosis and treatment.

v. Awareness Initiatives like the recently launched 'Eat Right Movement'

vi. Eat Right Mela by FSSAI aims to usher in a 'new food culture' by nudging the businesses and consumers to adopt safe, healthy and sustainable food practices in India.

- Way forward: Prevention and Control of NCDs

- » The prevention and control of NCDs will require comprehensive approach in which all sectors including health, education, finance, transport, urban planning and others will need to play a role in reducing the risk factors and treating the existing NCDs.
- » **Promoting healthy diet, physical activity etc**

- » Reducing both outdoor and indoor pollution will go a long way in fighting against chronic respiratory diseases, cardiovascular diseases, diabetes and lung cancer.
- » Restricting use of Sin goods
 - Prohibition or higher taxes on tobacco products and alcohol
 - More duties on unhealthy food
 - Replacing trans fats with poly unsaturated fats
- » Effective Policy implementation
 - Government of India has already launched a number of initiatives such as National Health Policy, India Hypertension initiative, establishment of 1.5 lakh health and wellness centres etc.
 - Proper implementation of these policies and programs will go a long way in reducing NCDs in India.
- » More Investment in better management of NCDs
 - More facilities for detection, screening and treatment of these diseases especially in rural areas and for providing palliative care for people in need.
 - This kind of investment has huge economic value as it will not only ensure better productivity but reduces cost of treatment on later stages.
- » More R&D to fund cost effective solutions and better ways of management of diseases.

C) BLOOD PRESSURE / HYPER TENSION

- Why in news?
 - » Who releases its first-ever report on global impact of high BP, states approximately four in every five not treated adequately (Sep 2023)
- What is Blood Pressure?
 - » **Blood pressure** is a measure of how much the blood moving through your arteries pushes against the vessel walls. According to medical standards, the reading on a doctor's BP monitor going above 140/90 accounts for **hypertension**. **High Blood Pressure (Hypertension) is a serious medical condition** that significantly increase the risks of heart, brain, kidney and other diseases.
 - » A large number of people who suffer from hypertension are unaware of this, therefore it is also sometimes referred as a silent killer.
 - » It is a condition that knows no boundaries affecting people of every age and different socio-economic conditions. It can't be cured but can be managed through lifestyle changes, medication, and regular monitoring.
- WHO Report on Global Impact of High BP (Sep 2023)
 - Hypertension affects 1 in 3 adults worldwide and around 1/3rd of the adults with hypertension are unaware of their conditions. Nearly 4/5 people with hypertension are inadequately treated. Scaling up coverage can avert 76 million deaths between 2023-2050.
- The number of people living with hypertension (blood pressure of 140/90 mmHg or higher or taking medication for hypertension) doubled between 1990 and 2019, from 650 million to 1.3 billion.
- Hypertension Situation in India:
 - As per a paper published in *The Lancet*:
 - Hypertension is the most important risk factor for death and disability in India.

- Less than 1/4th of hypertensive patients in India had their blood pressure under control during 2016-2020.
 - There is a growing prevalence of hypertension amongst younger adults and those from lower socioeconomic backgrounds.
 - **NFHS-5** reported a hypertension prevalence of 24% in men and 21% among women, an increase from 19% and 17% respectively from the previous round (NFHS-4)
- **Key Issues with Hypertension situation in India:**
- i. **Lack of Awareness:** As per WHO, 1/3rd of the hypertension patients don't even know that they are suffering from hypertension.
 - ii. **Limited Access to healthcare services**
 - iii. **Inadequate adherence** to medication and lifestyle modifications
- **Way Forward:**
- » **Improving Awareness:**
 - » **Lifestyle changes:** Eating Healthier diet, quitting tobacco, being more active -> this can help lower the blood pressure.
 - Other changes like reduced salt intake, reduce alcohol consumption can also help.
 - » **Early Detection and Effective management** have to be prioritized by countries.
 - Hypertension can be controlled effectively with simple, low-cost medication regimens and yet only 1/5 people in hypertension have controlled it.
 - **Medication adherence** is crucial for control. Forgetfulness among elderly to take medication, medication availability, and affordability pose barriers.
 - Strengthening hypertension control must be part of every country's journey towards universal health coverage.

2. PRELIMS FACTS

1) PLACES IN NEWS: NAGORNO-KARABAKH

Caucasus Region:

It is a region between Black Sea and the Caspian Sea and mainly occupies **Georgia, Armenia, Azerbaijan and Southern Russia**.

It is home to the **Caucasus Mountains** which has been traditionally considered a natural barrier between Eastern Europe and Western Asia.

Europe's Highest Mountain - Mount Elbrus (5,642 meters) (located in Russia) is in the western part of the Greater Caucasus Mountain range.



NAGORNO-KARABAKH CONFLICT BETWEEN ARMENIA AND AZERBAIJAN

Straddling western Asia and Eastern Europe, Nagorno-Karabakh is internationally recognised as part of Azerbaijan, but most of the region is controlled by Armenian separatists.

Nagorno-Karabakh has been part of Azerbaijan territory since the Soviet era.

When the Soviet Union began to collapse in the late 1980s, Armenia's regional parliament voted for the region's transfer to Armenia; the Soviet authorities turned down the demand.

Note: Religious differences: People of Ngorno Karabakh are primarily Christians whereas Azerbaijan is Muslim dominate.

Years of clashes followed between Azerbaijan forces and Armenian separatists.

The violence lasted into the 1990s, leaving tens and thousands dead and displacing hundreds of thousands.



In 1994, Russia brokered a ceasefire, by which time ethnic Armenians had taken control of the region.

In November 2020, Russia brokered a new peace deal between Armenia and Azerbaijan, after the two countries engaged in military conflict for six weeks over the disputed region in South Caucasus. The armistice also placed a Russian Peacekeeper contingent in Nagorno-Karabakh.

Since then, Azerbaijan alleges that Armenia has smuggled in weapons since then.

2023:

In Sep 2023, Azerbaijan's forces opened fire on Armenian positions in the Ngorno-Karabakh region. It claimed that it was an "anti-terrorist operation". There were concerns that the tensions could escalate into full fledged war.

Later, on 20th Sep 2023, Azerbaijan halted military action after its battlefield successes forced Armenian separatist forces to agree to a ceasefire. Key Highlights:

1. Azerbaijani military had routed separatists and then separatist agreed to cease fire.
2. They are meant to disband and disarm under the deal.
3. Talks on future of the region due to start in 1-2 days.

Highly tensed relations between Armenia and its long-time ally Russia.

- Armenia angered Russia, which maintains a military base in the country, by holding military exercise with the USA in Sep 2023 and by moving towards ratifying Rome Convention that created International Criminal Court, which has indicted Russian President Vladimir Putin.

2) PLACES IN NEWS: AGUMBE

- Why in news?
 - » How Karnataka's Agumbe lost to little known Udupi towns (Sep 2023)

- About Agumbe:

Agumbe Rainforest Complex (ARC) is located in Shivamogga district of Karnataka in Western Ghats. It is known for its very heavy rainfall of over 8,000 mm during Monsoon. Therefore, it had also been christened as the Cherrapunji of the South. Britishers had erected the first rain gauge here in 1882.

However, there might have been many places in Karnataka which received more rainfall than Agumbe. But they didn't have rain gauge. The situation changed in 2022 when many of them got their own rain gauge which became operational in 2023.

Therefore, Karnataka's Agumbe is losing to several towns of Udupi.



3) INFRASTRUCTURE: PAMBAN BRIDGE – INDIA'S FIRST VERTICAL LIFT RAILWAY SEA BRIDGE

- Why in news?

» New Pamban Bridge may miss its Nov 2023 deadline (Sep 2023)

- Details

» **Background:** The existing Pamban Rail Bridge, which connects Rameswaram to mainland India is more than a 100 years old. It was built in 1914 and connects Mandapam to the Rameshwaram Island. Till 1988, it was the only link connecting the two locations when a new road bridge was built parallel to the sea link.



- New Railway Bridge:

» The state-of-the-art bridge will be country's first vertical lift railway sea bridge.

- The bridge is stretches for 2.05 km and will have a 63-meter stretch which will lift up while remaining parallel to the deck to allow access to the ships.

» It will help railways to operate trains at higher speed and will carry more weight and increase the volume of traffic.

» It is being executed by Rail Vikas Nigam Limited (RVNL) at a cost of Rs 535 crores.

- Missing Deadlines (Sep 2023)

- » Its initial deadline was March 2023, which was then extended to July 2023 and then to Nov 2023. However, in Sep 2023, due to increased wind speed at the project site the work has been hampered.
- » As of Dec 2022, 84% work has been completed.

- **Video:**

- » See video in the link: <https://www.thehindu.com/news/national/tamil-nadu/watch-pamban-bridge-indias-first-vertical-lift-railway-bridge/article65487414.ece> to get better understanding.

4) BIODIVERSITY: GAUR / INDIAN BISON

It is also known as Indian Bison and is a bovine native to South Asia and Southeast Asia. It is the biggest among wild cattles.

IUCN: VU

Habitat: Largely confined to evergreen forests or semi-evergreen and moist deciduous forests.

Historical Distribution: It occurred throughout mainland south and southeast Asia.

Present Distribution:

- But today the population is fragmented, with it being extinct from Sri Lanka and Malaysian Peninsula.
- They are largely confined to evergreen forests or semi-evergreen and moist deciduous forests, but also inhabits deciduous forest areas at the periphery.

Note: The domesticated form of the gaur is called gayal (Bos frontalis) or mithun.



Distribution in India:

- **Western Ghats** in particular Wayanad - Nagarhole - Mudumalai - Bandipur complex constitute one of the most extensive extant strongholds of gaur. Nilgiri forest division is estimated to have a population of more than 2,000.
- **Eastern Ghats** also has some population of gaurs in Odisha and Andhra Pradesh.

Interesting Fact: The famous drink "Red Bull" is based on a Thai drink 'Gratin Daang', meaning "red gaur".

Bos frontalis (Mithun) - Domesticated form of Gaur:

Recent News: The Food Safety and Standards Authority of India (FSSAI) has recognized the mithun as a 'food animal' with effect from 1st Sep. With this, the mithun can be commercially farmed and its meat processed for pickles, soups, wafers nd biryani.

Work is on to help farmers and triba village communities benefit commercially from the sale and processing of Mithun.

The **Animal** is endemic to Arunachal Pradesh, Nagaland, Manipur and Mizoram. It is semi-domesticated and is reared in free range forest ecosystem. The only supplementary feed that it needs is salt.

It is the **state animal** of both Arunachal Pradesh, and Nagaland. The slaughter of the mithun is traditionally reserved for special occasions such as festivals or weddings (and now a days - elections)

Biodiversity Significance: The "food animal" status can increase the commercial value and may increase the population of Mithun.

Mithuns: From farms to the table



A KG OF
MITHUN MEAT
CAN FETCH
₹300 PER KG

5) BIODIVERSITY: RHINOS

D) WORLD RHINO DAY, 22ND SEP

- World Rhino Day was first announced by WWF in South Africa in 2010.
- It is observed every year on 22nd Sep and celebrates all five species of rhino: Black, White, Great-one horned, Sumatran Rhino and Javan Rhino.
- It serves as a poinant reminder of the urgent need to protect these magnificent creatures that roam the forested landscapes of our planet.

E) VARIOUS SPECIES OF RHINO

- **2 Rhino in Africa:**
 - » White Rhino: NT

- **Great Comeback:** From a population of around 100 individuals, the population had increased to more than 21,000 at the end of 2012. But since then, the population has decreased by 24% (to around 16K). But it is still the largest population of any Rhino species on earth.
- » **Black Rhino: CR**
 - Population is recently increasing. They are spread across 12 African countries. From a population of around 100,000 in 1960s, they had come down to 2,300 individuals in the 1990s. However, intense protection and management efforts have led to stabilize and increased population by 28% in the past decade.
- **3 Asian Rhino**
 - » **Greater One Horned Rhino:** (VU)
 - » **Javan Rhino: CR**
 - Stable Population (76)
 - » **Sumatran Rhino: CR**
 - Decreasing population (34-47)

F) GREAT INDIAN ONE-HORNED RHINO (VU)

Details: Fifth largest land animal.

Threats:

- » Poaching - rhino horn great demand in China and other Asian countries for traditional medicines.
- » Habitat loss
- » Fragmentation of Habitat

Habitat and Distribution

- » **Past:** Once ranged throughout the entire stretch of Indo-Gangetic Plain.
 - Population went down to a mere 200 in the early 1990s and was declared to be endangered.
- » **Present:** Found only in the tall grasslands and forests in the foothills of the Himalayas. Today more than 3,000 Rhino live in wild, most of them confined in Assam (2500+). They range from few pockets in Southern Nepal, northern Bengal, and Brahmaputra Valley.
 - Today, they are mostly found in 7 protected areas:
 - In Assam: Kaziranga National Park, Pobitora WLS, Orang NP, Manas NP
 - In WB: Jaladapara NP and Gorumara NP
 - In UP: Dudhwa NP



Indian rhinoceros (*Rhinoceros unicornis*)
in the Kaziranga National Park

Conservation status							
<u>Extinct</u>						<u>Threatened</u>	
EX	EW	CR	EN	VU	NT	LC	
Vulnerable (IUCN 3.1) ^[2]							

6) BIODIVERSITY: NEW FISH SPECIES DISCOVERED – PTERYGOTRIGLA INTERMEDICA (SEP 2023)

The scientists of Zoological Survey of India (ZSI) have discovered this new fish species. It is the fourth species of Pterygotrigla genus reported in India so far.

It is commonly known as gurnards or sea-robins and belong to the family Trigidae.

Discovered where: It's a marine water fish discovered from **Digha Mohana** in WB.



7) S&T: RASHTRIYA VIGYAN PURUSKAR (SEP 2023)

- Rashtriya Vigyan Puruskar is a new set of National Awards in the field of Science, Technology and Innovation. It will be one of the highest recognitions in the field of science, technology and innovation in India.
- **Who will be eligible?**
 - » Scientists/technologists/innovators working in government, private sector organizations or any individual working outside any organization, who have made contributions in terms of path-breaking research or innovation or discovery in any field of science, technology, or technology-led innovation shall be eligible for awards.
 - » **People of Indian Origin** staying abroad with exceptional contributions benefitting the Indian communities or society shall also be eligible for the awards.
- The award shall be given in following **Four Categories**:
 - » **Vigyan Ratna** (VR): It will recognize lifetime achievements & contributions made in any field of S&T.
 - » **Vigyan Shree** (VS) award will recognize distinguished contributions in any field of S&T.
 - » **Vigyan Yuva-Shanti Swarup Bhatnagar** (VY-SSB) award will recognize and encourage young scientists upto the age of 45 years who made an exceptional contribution in any field of S&T.
 - » **Vigyan Team** (VT): It will be given to a team comprising of three or more scientists, researchers, innovators etc who have made an exceptional contribution in any field of S&T.
- It will be given in 13 domains, namely Physics, Chemistry, Biological Sciences, Mathematics & Computer Science, Earth Science, Medicine, Engineering Sciences, Agricultural Science, Environmental Science, Technology & Innovation, Atomic Energy, Space Science and Technology, and Others. The representation from each domain/field, including gender parity will be ensured.
- All nominations for these awards will be placed by **the Rashtriya Vigyan Puraskar Committee (RVPC)** to be headed by the Principal Scientific Advisor (PSA) to GoI and comprising of Secretaries of Science Department, members of Sciences and Engineering Academies, and some distinguished scientists and technologists from different fields of S&T.
- **Important Days:**
 - » The nomination for these awards will be invited every year on 14th Jan which would remain open till 28th Feb (National Science Day).

- » The awards shall be announced on 11th May (National Technology Day) every year. The Award Ceremony for all categories will be held on 23rd of August (National Space Day).
- All awards will have a Sanad & Medal.



CURRENT AFFAIRS PROGRAM

PRE-CUM-MAINS 2024

SEP 2023 : BOOKLET-4

RENEWABLE ENERGY

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1. RENEWABLE ENERGY

- **Example Question:**
 - » Discuss the significance of renewable energy in India's sustainable economic development. What are the factors hindering the growth of renewable energy sector in the country? Suggest some measures to deal with these problems. [15 marks, 250 words]
 - » Evaluate the economic and employment opportunities presented by the renewable energy sector in India [10 marks, 150 words]
- **Introduction**
 - » Non-conventional energy sources refer to renewable energy sources which are replenishable at a rate faster than it is consumed i.e., they don't get depleted when used. These sources are also much less hazardous to environment compared to conventional sources of energy.
 - » **Popular Sources of Non-Conventional Energy Sources are:**
 - i. Solar Energy
 - ii. Wind Energy
 - iii. Tidal Energy
 - iv. Geothermal Energy
 - v. Hydropower
 - vi. Biomass Energy
 - vii. Fuel Cell (Green Hydrogen)
- **India's Situation:**
 - » As of Feb 2023, India's total power generation capacity was **412.21 GW**.
 - **Total Renewable Energy Capacity: 168.96 GW** [122 GW without including large hydro]
 - **Solar Energy:** 64.38 GW
 - **Wind Energy:** 42.02 GW
 - **Hydro** (large + Small): 51.79 GW (Small Hydro - Around 5 GW)
 - **Bio:** 10.77 GW
 - Another **86.62 GW** of green energy capacity is under implementation and **40.89 GW** of capacity is under various stages of tendering.
- **Future Target:** Government aims to achieve 500 GW of installed electricity capacity from non-fossil sources by 2030.
- **India's NDC and Renewable Energy:**
 - » While the target was to achieve 40 per cent of the installed electric capacity from non-fossil fuel sources by 2030 in the initial NDC submitted in 2015, the target has already been achieved.
 - » India is now striving to achieve the target of 50 per cent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030, in line with updated NDCs.
- **Why do we need to invest more in the Renewable Energy Sector?**
 - » **Energy Security and Reduced Import Dependency:** As for fossil fuels, India is mostly dependent on crude oil imports.
 - » **Economic growth:**
 - Reduced cost of energy supply

- Reduced CAD -> Saving Forex
 - Opportunity to emerge as a renewable energy hub for the world -> this can become an important source of employment and entrepreneurship.
 - Improved export opportunity in the non-conventional energy sector.
- » **Inclusive Development: Electricity in inaccessible areas**
- Solar, small hydro, wind energy etc. can easily provide electricity in the region where Grid connected electricity has not reached.
- » **Environmental sustainability:**
- **Fighting Climate Change:** Meeting NDCs submitted at COP26 of UNFCCC.
 - **Reducing Air Pollution and Water Pollution**
- » **Strengthening India's Soft Power and Global Leadership:** India could also handhold other developing nations to explore the path of sustainable development via making best utilization of non-conventional sources of energy.
- **Steps taken by Government:**
- » **Ambitious Targets:** GoI has set a target of achieving 50% of its electricity supply through non-fossil sources by 2030.
 - » **Attracting Investment:** FDI upto 100% under automatic route for renewable energy projects including offshore wind energy projects has been allowed.
 - » **Promoting Ease of Doing Business:**
 - **Waiving of Inter-State Transmission System (ISTS)** charges for inter-state sale of solar and wind power for projects to be commissioned by 30th June 2025.
 - **Laying of new infrastructure:** New transmission lines and subs station capacity for evacuation of renewable power etc. under Green Energy Corridor scheme for evacuation of renewable energy
 - » **Sectoral Initiatives:**
 - **National Solar Mission**
 - Setting up of ultra-mega renewable energy parks to provide land and transmission to renewable energy developers on a plug and play basis.
 - **Pradhan Mantri Kisan Urja Surakha Evam Utthaan Mahabhiyan (PM-KUSUM):** It is aimed a de-dieselization of the farm sector along with providing energy security and increased income for farmers.
 - **National Hydrogen Mission:** It aims to make India a green hydrogen hub, aiding to fulfill its target of production of five million tonnes of green hydrogen by 2030 along with allied development of renewable energy capaacity.
 - In Aug 2022, India's first indigenously developed Hydrogen Fuel Cell Bus developed by KPIT-CSIR was launched.
 - **Steps to promote wind Energy:**
 - National Offshore Wind Energy Policy notified in 2015
 - National Wind Solar Hybrid Policy was adopted in 2018
 - **Steps to promote bioenergy:**
 - National Policy on Biofuels

- Scheme to support promotion of Biomass based cogeneration in sugar mills and other industries
 - Program on Energy from Urban, Industrial and Agricultural Wastes/Residues
 - Biogas Power (Off-Grid) Generation and Thermal Application Program (BPGTP)
- » **International Collaboration:**
 - International Solar Alliance
 - Global Biofuel Alliance announced during 2023 G20 Summit in India.
- **Electricity (Promoting Renewable Energy through Green Energy Open Access) Rules, 2022** notified (June 2022) - It is aimed at ensuring access to affordable, reliable, sustainable and green energy for all.
 - **Electricity (Promoting Renewable Energy Through Green Energy Open Access) Amendment Rules, 2023 (Jan 2023)**
- **Problems faced by Renewable Energy Sector**
 - i. **Mobilization of Finance and investments:** India is a developing country with limited resources and renewable energy sector is a capital-intensive sector.
 - ii. **Land Acquisition:** Solar and wind Power projects require large land areas, which has in recent years emerged amongst the biggest challenges faced by the sector.
 - For e.g., windmills and Solar plants are impacting the habitats of critically endangered the Great Indian Bustard.
 - iii. **Intermittent Nature of Renewable, Lack of energy storage, and wastage (15-20%)**
 - This makes grid integration difficult.
 - The absence of storage facilities leads to wastage to the tune of 15-20% of electricity generated.
 - iv. **Poor Manufacturing Ecosystem** in the country leads to import dependency for wind mills and solar power panels.
 - v. **Lack of Skilled Manpower:** India still has not been able to attract youth towards this sector. Moreover, the opportunity to train in the sector is also negligible
 - vi. The **financial conditions of our distribution companies (discoms)** is another hindrance.
 - The additional solar and wind capacity will come from private sector and developers would be discouraged if they are not assured of market and timely payments.
 - vii. **International Trade Rules**
 - WTO trade rules have sometimes hindered our local manufacturing.
- **What further needs to be done?**
 - » **For increasing Finance**
 1. More government investment
 2. Creating mandates for provident funds to invest in infrastructure and environmentally sustainable projects.
 3. Increasing the priority sector lending limit for bank loans under solar energy from a meagre Rs 15 crore.
 4. Mobilizing retail savings by way of tax exemption on the lines of Section 80CCF
 5. Promote Green Bonds.
 - » Standardizing the definition of green to be able to target government efforts in the direction.
 - » Promoting more R&D on Green sector
 - » Promoting local manufacturing

- » **Dealing with intermittency and wastage** (due to variability and lack of storage facilities)
 - Focus more research towards storage technology -> use tax incentives and VGF.
 - Promoting use of smart grid, net metering and storage devices.
 - Redesign power markets to reflect the new feed for flexible supply and demand
 - **Options available for storage:** Hydrogen based storage, lithium ion batteries, and pump storage plants.
 - Hydrogen based storage is used for long term
 - Lithium-ion batteries are suitable for day-to-day storage
- » **Dealing with Land Acquisition Issues:**
 1. **Minimising total land-use requirements** for renewable energy by promoting offshore wind, rooftop solar and solar on water bodies
 2. **Identification and assessment of land for renewable generation** by limiting undue regional concentration and developing environmental and social standards for rating potential sites.
 3. **Attention on Indian agri-voltaics sector** — securing benefits to farmers and incentivising agri voltaics uptake where crops, soils and conditions are suitable and yields can be maintained or improved.
- » **Ensure Greater Synergy among all the concerned stakeholders** through a participatory approach and awareness generation, can further help to fasten the pace of shift towards renewable sources of energy.
- » **International Cooperation:**
 - Renewable Energy Technology should be declared as a global public good, including removing of IPR barriers to technology transfer.
 - Improve global access to supply chains for renewable energy technologies, components and raw material.
- **Conclusion1:** Time is not on our side and our climate is changing before our eyes. We need a complete transformation of the global energy system.
- **Conclusion2:** By addressing these challenges and implementing these measures, India can further accelerate its transition to renewable energy, promoting sustainable economic development while reducing its environmental footprint.

2. PROBLEM OF STORAGE IN RENEWABLE ENERGY

- **Introduction:**
 - » India is emerging as a renewable energy powerhouse with a target of 450 GW of installed RE capacity by 2030. However, the country faces a major challenge in the form of lack of storage capacity.
- **Why is storage needed in renewable energy sector?**
 - » **Handling Intermittency and variability problem** of renewable due to sudden cloud cover and decreased wind velocity.
 - » **Providing energy in non-solar/wind hours**

- India's doesn't feel the pinch right now because we have more than 200 GW of coal based capacity which is managing the show by backing renewables in case of variability. So, decarbonization will be difficult without finding an alternative.
- **Various Storage options and their benefits and Limitations**
 - i. **Hydrogen based storage:**
 - It is found feasible for long-term storage (cross seasons)
 - ii. **Lithium-ion batteries:** They are the ideal source for day-today storage.
 - **Concerns:** Though the cost of batteries have declined by 80% over the last decade, it is still quite expensive as the levelized cost of battery is about Rs 8 to Rs 10 per unit.
 - iii. **Pump Storage Plants:**
 - India has a total capacity of about 4.7 GW (out of a worldwide capacity of 149 GW). The CEA estimates that India's storage potential is of 100 GW.
 - **Concerns:**
 - High investment cost
 - Long Gestation Periods
 - Non-remunerative pricing models
 - Lack of adequate sites having the required topography
 - India's expertise in pump storage plants is somewhat a suspect with the Tehri pump storage project yet to be commissioned though construction began in 2011 and was to be complemented in 4.5 hours.
 - There may be environmental concerns associated with this kind of storage.
- In general, we can say that there are two main reasons for lack of storage capacities:
 - » **Cost** of storage technologies is still relatively high.
 - » **Regulatory Framework** for storage is not yet fully developed.
- Some initiatives to deal with these challenges:
 - i. **Budget 2023:**
 - Pumped Storage Projects have received a push with a detailed framework to be formulated.
 - **4 GWh Battery Energy Storage Systems supported through Viability Gap Funding (VGF)**.
 - ii. **National Storage Mission** launched in 2020 and wants to develop 100 GW of storage capacity by 2030.
 - iii. **The Green Energy Corridor:** These are corridors which will be used to transmit electricity from renewable energy projects to load centres. These will also include storage facilities.
 - iv. The **National Battery Manufacturing Policy**, launched in 2020, aims to promote the manufacturing of batteries in India. This will help to reduce the cost of storage technologies.
- These are steps in the right direction, however, more efforts needs to be put to expand the capacities in parallel with the expansion of the renewable energy.
 - i. **More R&D in battery storage** to reduce the cost: Government should increase the financial incentive and subsidies to development and adopt more advanced energy storage technologies.

- ii. **Grid Modernization:** To accommodate energy storage and intermittent renewable energy sources effectively. Implement smart grid technologies to enhance grid flexibility.
 - iii. **Finalize a regulatory framework** which would help investors to develop and deploy storage projects.
 - iv. **Public Private Partnerships** - It can be used to develop and deploy storage projects.
 - v. **Demand Side measures** to reduce the need of storage e.g. smart metering, smart grid, energy efficiency etc.
 - vi. **Skill Development (Human Resource Creation):** To develop workforce capable of designing, installing and maintaining energy storage systems.
 - vii. **International Collaboration** bilaterally and multilaterally to leverage best practices and sharing knowledge on energy storage solutions.
- **Conclusion:** These steps have the potential to increase the storage capacity for renewable energy sector and to help to make renewable energy a more reliable and affordable source of electricity.

3. DECENTRALIZED (DISTRIBUTED) RENEWABLE ENERGY

- **Example Question:**
 - » "Decentralized renewable energy play a vital role in transitioning towards a more sustainable and resilient energy future, particularly in areas where centralized grid infrastructure is inadequate or non-existent" Critically Analyze [10 marks, 150 words]
- **Decentralized Renewable energy** refers to generation and distribution of renewable energy at a small and localized level, typically closer to the point of consumption. It can be generated via several renewable energy sources, including solar, wind, hydro and bioenergy.
 - » Currently, India has 12 mature technologies powered by DRE. These include high capacity irrigation pumps, as well as micro-pumps, silk reeling machines, dryers, charkhas, small horticulture processors, small refrigerators/deep freezers, cold storages, vertical fodder growing institutions units, grain milling machines etc.
 - » The DRE technologies include solar run textile manufacturing units, biomass powered cold solar storages and micro solar pumps etc.
- **Key characteristics** include localized generation, distributed energy resource, Off-Grid or Mini-Grid Solutions;
- **Advantages:**
 - » **Environmentally sustainable:** DRE doesn't lead to environmental damages which are caused by large scale hydropower plants, large scale solar parks etc.
 - » **Energy Security:** Technologies like rooftop solar, micro hydel power plants etc. can lead to sustainable energy production and thus can ensure long term energy security.
 - » **Inclusive Growth:** DRE can ensure energy supply and thus other associated services in remote, under-developed regions.
 - » **Scalability and Flexibility:** DRE can be scaled gradually depending on the local needs.
 - » **Job Creations:** DRE will stimulate local job opportunities in manufacturing sector, installation, operations etc.
 - As per MNRE, DRE has a market potential of Rs 4 lakh in rural and peri-urban communities in India.
- **Challenges and way forward**

- » **Repairing** remained a challenge: Enough human resource and contact with manufacturers is still poor, especially in remote areas.
 - Skill development can not only improve the repair services but can also provide increased job opportunities.
 - » **Increasing Affordability** - For a lot of people, affordability is a major concern and increased access to loans/government incentives is crucial for accessing the DREs.
 - At the same time, development of DRE industries in India, more R&D, etc. would be important for reducing the cost of the technology.
 - » **Policy supports** especially at state level: In India state level policy schemes are incapable of effectively supporting DRE technologies, especially when it comes to enabling affordable financing for entrepreneurs and end-users.
 - » **International Cooperation** across sectors for an equitable exchange of knowledge and resources is essential for scaling DRE technologies.
- **Conclusion:**
- » DRE can play a vital role in transitioning towards a more sustainable and resilient energy future, particularly in areas where centralized grid infrastructure is inadequate or non-existent.

4. SOLAR

- **Introduction:**
 - » Though India missed the ambitious target of 100 GW of solar power generation capacity by 2022, we still need to keep working on expanding Solar Energy Capacity.
 - » As per the National Electricity Plan, India aims to reach a target of 185.6 gigawatts of solar capacity by the FY27.
- **Advantages of Solar Energy**
 - » **Renewable Energy Advantages**
 - (climate change, pollution, Energy Security, Economic Opportunities, Inclusive growth, cost competitiveness, reduce import deficiency etc.)
 - » **Solar's advantage over other renewable energy:**
 - Available during office hours
 - Longer life equipment
 - Low running cost
 - India's tropical climate is suitable for solar energy
 - Less damaging than other renewables
 - A new study by WWF and IRENA found that wind and solar power are significantly less damaging than other renewable pathways.
 - » **Solar Energy is becoming more and more competitive**
- **Government Efforts to promote Solar Energy**
 - i. **Jawaharlal Nehru National Solar Mission (JNNSM)** - aimed at achieving 100 GW of solar power by 2022 (60 GW through large and medium scale solar power projects and 40 GW of rooftop solar)

- ii. **Pradhan Mantri Kisan Urja Suraksha Evan Uttham Mahabhiyan (PM Kusum)** aims at providing water and energy security to farmers and enhancing their income by making *Annadata* also a *Urjadata*. It focuses on creation of **3 things** - Grid Connected Renewable solar power plants; Installation of 20 lakh standalone Solar powered agri pumps; Solarization of 10 lakh grid connected agri pumps.
 - iii. **Steps to ensure easy finance for Solar energy.**
 - **Increased government spending:** For e.g., the Budget 2023 allocated Rs 10,222 crore to MNRE which is 45% higher than the previous allocation.
 - 'Off-Grid' solar projects have seen an increase in allocation to 360 crore which is 6 times higher than last year.
 - **Financial Incentives:** Generation based incentives (GBIs), capital and interest subsidies, viability gap funding, concessional finance, fiscal incentives etc for providing financial support for various schemes have been initiated.
 - **New tax-free solar bonds.**
 - Making roof top solar as part of housing loan by banks/NHB.
 - iv. **International Cooperation:** International Solar Alliance, One World One Grid etc.
 - v. **New Innovations: Floating Solar Power Plant** (for e.g., the 100 MW plant at NTPC Ramagundam commissioned in July 2022) is being set up in various parts of the countries. It brings advantages like no land acquisition requirements, water conservation (less evaporation of water), less dust on power panel etc.
 - vi. **Other steps to promote solar sector.**
 - **Amendments to Electricity Act and Tariff Policy**
 - For strong enforcement for Renewable Purchase Obligations and for providing Renewable Generation Obligations (RGO).
 - Evacuation of renewable energy through Green Energy Corridor project.
 - Amendment to building by laws for mandatory provision of roof top solar for new construction or higher floor area ratio.
 - Infrastructure status to Solar projects.
 - Provision of rooftop solar and 10% renewable energy as mandatory under mission statements and guidelines for development of smart cities.
 - vii. **Promoting Domestic Manufacturing of Solar PV cells and various components**
 1. **National Programme on High Efficiency Solar PV Modules**
 - It is a PLI scheme which aims to build an ecosystem for manufacturing of high efficiency solar PV modules in India, and thus reduce import dependence in the area of Renewable energy. It will strengthen Atmanirbhar Bharat initiative and generate employment.
 - viii. **Promoting Competition among States:** SARAL index by MNRE ranks states in terms of their efforts to incentivize rooftop solar.
 - ix. **Skill Development:** Focus on skill development of workforce: "Surya Mitra Scheme" launched in May 2015. To create 50,000 trained personnel within a period of five years
- **Some Problems faced by Solar Energy Sector**
- i. General Problems faced by renewable energy sectors like finance, technology, human resource, land, Global Trade Rules etc.

- ii. **Substandard Equipment and Lack of Accountability**: For e.g. in Assam, under DDUGJY, Solar kit was distributed to ensure rural electrification, but when problems occurred either in the panel or the batteries, even within the contract period, the replacements haven't happened.
- iii. **Poor Performance of Rooftop Solar Power Projects**
 - » A parliamentary panel (March 2023) has attributed low installation of solar rooftop and wind energy projects as key reasons for the shortfall in achieving India's renewable energy capacity target of 175 GW by 2022.
 - » **Key Reasons**
 - a. **Residential Roof top policy** wasn't very effective. Government's policy was primarily focused on industrial rooftop.
 - b. **Lack of cooperation from state electricity utilities and distribution companies** across India as it could hurt their finances.
 - c. **India still doesn't have uniform policies around net metering**.
 - d. **Lack of awareness amongst public**
 - For e.g., not many people are aware that with their home loans they can get loans for solar rooftops too.
 - Further, people are not aware of the financial incentives and attractive return on investment that taking up rooftop solar power solutions can achieve.
- iv. **Import Dependency:**
 - » Much of India's solar PV manufacturing uses imported components with parts mostly sourced from China. In the Budget announced in Feb 2022, government has announced a Basic Customs Duty of 40% on modules and 25% on solar cell imports from 1st April.
- v. **Intermittency -> Lack of energy storage facilities.**

- **Some Limitations of expanding Renewable Energy:**
 - i. **Land Acquisition -> Ecological and biodiversity losses**: Even dry regions support native vegetation such as grass, herbs and shrubs. They are diverse, ranging from woodland savannas, scrubland and grasslands, to rocky outcrops, ravines and dunes. They have some protected species like black buck and Great Indian Bustard.
 - ii. **Loss of Ecological services** - like sequestering of more carbon than if trees were planted on them. Grazing based livelihoods also support millions in India.
 - iii. **Displacement**: In Kutch, communities displaced from their traditional grazing lands by renewable energy projects have been protesting these projects.
 - iv. **Emerging E-Waste Challenge**: As per a report by International Renewable Energy Agency (IREA), India could be generating more than 4 million tonnes of photovoltaic waste by 2050.
 - Currently, India is recovering about 20% of the photovoltaic waste, rest is dealt with informally. This waste gets accumulated at landfills which in turn cause leaching of toxic metals in soil and water.

- **Way Forwards**
 - i. **Increased focus on Rooftop Solar**: Development of positive retail led ecosystem to promote rooftop solar.
 - » **Improved policy of rooftop solar** - Increased focus on awareness generation.
 - » **Prioritize smart grid and net metering**.

- » **Incentivize discoms** by providing them with performance linked incentives.
- » **Improving Tender Process** under DDUGJY: Tender process should be based on a '**Quality Cost Based System**', a well-accepted methodology for vendor selection globally which evaluates bidders based on technical and quality scores before looking at cost.
- » **More focus on creating skilled workforce:** Government tenders for solar rooftops should have clause for training locals in maintenance by teaching them the required skill sets and generating job opportunities for them.
- ii. **Agri-Voltaics** - Deploying solar panel in a manner which allows agriculture below it.
 - » **Advantages:** Reduces evapo-transpiration and saves water; cooling effect of plants improves the efficiency of the solar power panels.
- iii. **Ensure effective implementation of Social Impact Assessment and Environmental Impact Assessment** in large scale projects.
- iv. **Deal with photovoltaic waste:**
 - » **Formulate and implement provisions specific to photovoltaics waste treatment** (rather than clubbing it with e-waste). This should also include EPR.
 - » Pan India sensitization drive about photovoltaic waste.
 - » More R&D in development of better recycling mechanisms.
- v. Other steps discussed under Renewable Energy Section above.

5. WIND

1) WIND ENERGY

- **Current Wind Energy Situation in India**
 - » India has made significant progress in the development of wind energy and has emerged as the fourth largest producer in the world with a total capacity of 42 GW as of Feb 2023.
 - » But India **did miss the target of achieving 60GW** capacity by 2022.
- **Target:**
 - » 140 GW by 2030
- **India's Potential:**
 - » As per National Institute of Wind Energy (NIWE) in Chennai, India has a much higher wind power potential. At a hub height of 120 meters, the potential is of 602 GW of onshore and 100 GW of fixed and floating offshore. A very remarkable fact is that half of the potential is located in wastelands.
- **Recent Steps taken by Government.**
 - i. **National Wind Mission (NWM)** - launched in 2015 as part of NAPCC -> To achieve the target of 60 GW by 2022 with an investment of 10 lakh crore.
 - ii. **Scheme for Procurement of Blended Wind Power from 2500 MW ISTS connected projects.**
 - The objective of the Scheme is to provide a framework for procurement of electricity from 2500 MW ISTS Grid Connected Wind Power Projects with up to 20% blending with Solar PV Power through a transparent process of bidding.

- **Why did India miss its wind energy target?**
 - **Inconsistent policy environments** also discourage investment in the sector.
 - For e.g. In 2016, the government decided to withdraw 50 percent of accelerated depreciation benefit to industry from 2017.
 - **Legacy challenges** - infrastructure and transmission bottlenecks, financial conditions of discoms etc.
 - **Moving from feed in tariff system to e-reverse auction in 2017.**
 - Competitive bidding at low tariffs led to wind energy exploitation only remaining feasible in Gujarat and TN. In these two states plant Load Factor (PLF) is higher due to high wind speed.
 - The overemphasis on low tariff meant that tariff caps set for centrally sponsored auctioned projects are often too low to make the projects bankable or economically viable.
 - In 2022, MNRE has said that it would be doing away with the practice of reverse auction. This is expected to bring some relief to the wind energy sector.
 - **Cost Escalation:** Due to increased commodity prices
 - **Competition:** especially from cheaper photovoltaic power
 - **Reduced Policy Attention:** Government's policy focus has been on solar energy and wind energy has been reduced to playing a second fiddle, despite the fact that it was an early mover in the renewable energy sector.
 - **Land Acquisition** is emerging as another major issue.
- **What Further needs to be done?**
 - i. **Clear, well-defined policy**
 - Perhaps the keenly awaited Renewable Energy Law that has been in the making for quite some time now.
 - This would bring policy clarity and remove uncertainties in the sector.
 - ii. **Repowering** - i.e., upgrading the capacity of the existing wind turbines to produce more energy: It can increase productivity and spur socio-economic benefits.
 - iii. **Work on solving legacy challenges.**
 - Strengthening transmission infrastructure, DISCOMS and Changing State land policies to simplify land acquisition.
 - iv. **Develop Offshore wind roadmaps:**
 - The offshore wind measurement campaign can yield LiDAR data to identify bankable offshore wind zones.
 - Promote engagement among decision-makers at the federal, state and local levels of government, civil society organizations, and local stakeholder communities to align offshore wind development strategies and promote a collective understanding of offshore wind's socioeconomic benefits.
 - v. **Creating Export Potential for wind energy equipment**
 - Develop a technology exchange program and align Indian manufacturing based with global wind supply chain to create export-oriented opportunities.
 - Including these components in FTAs
 - vi. **Focus on modular and micro-wind turbines:** These can produce electricity at low wind speeds (5-6 kmph).
 - These micro-turbines could be fixed on terrace like a TV aerial; on street and highway lights; agricultural pumps; traffic signals etc.
 - It will reduce the land acquisition problem and would be suitable for regions which get continuous slow wind speed.

2) OFFSHORE WIND ENERGY

- **What is offshore wind energy?**
 - » It refers to deployment of wind farms inside the water bodies. They utilize the sea wind to generate electricity. These wind farms either use fixed foundation turbines or floating wind turbines.
 - A **fixed foundation turbine** is built on shallow water, whereas a **floating wind turbine** is built in deeper waters where its foundation is anchored in seabed. Floating wind farms are still in infancy.
- **Target:** MNRE has set a target of installing 5GW of offshore capacity by 2022 and 30GW by 2030.
- **India's offshore wind energy potential:**
 - » **MNRE:** India can generate 127 GW of offshore wind energy with its 7,600 km of coastline. Other sources mention it to be (World Bank Report - 195 GW (112 fixed and 83 floating);
- **Advantages of offshore wind energy parks:**
 - » Renewable Energy
 - » No land acquisition and land scarcity issues
 - » Offshore wind turbines are more efficient compared to onshore ones (wind speed over water bodies is high and is consistent in direction)
- **Steps Taken**
 1. **National Offshore Wind Energy Policy, 2015**
 - Nodal Ministry MNRE has been authorized for use of offshore areas within EEZ of the country
 - National Institute of Wind Energy (NIWE) has been authorized as Nodal agency for development of offshore wind energy in the country and to carry out allocation of offshore wind energy blocks, coordination and allied functions with related ministries and agencies.
 - National Targets for offshore wind energy capacity has been set at 5 GW by 2022 and 30 GW by 2030.
 2. In June 2022, MNRE has decided to bid out offshore wind energy blocks.
- **Challenges:**
 1. **General challenges of wind energy** as discussed above.
 2. **Technological and Engineering challenges:** High sea breeze, corrosive saltwater and challenging seabed conditions require technological and engineering advancements.
 3. **Local substructure manufacturers, installations vessels and trained workers** are lacking in India. Offshore wind turbines require stronger structures and foundations than onshore wind farms. This can cause higher infrastructure cost.
 4. **Maintenance** of offshore wind farms are more costly due to problems like cyclones.
 5. **Grid Infrastructure and Integration** will be challenges as the power generated at sea has to be transmitted to the onshore grid.
 6. **Environmental concerns:** Environmentalists are worried that noise from offshore wind farms could impact fish habitats.
- **Way forward to promote offshore wind energy:**

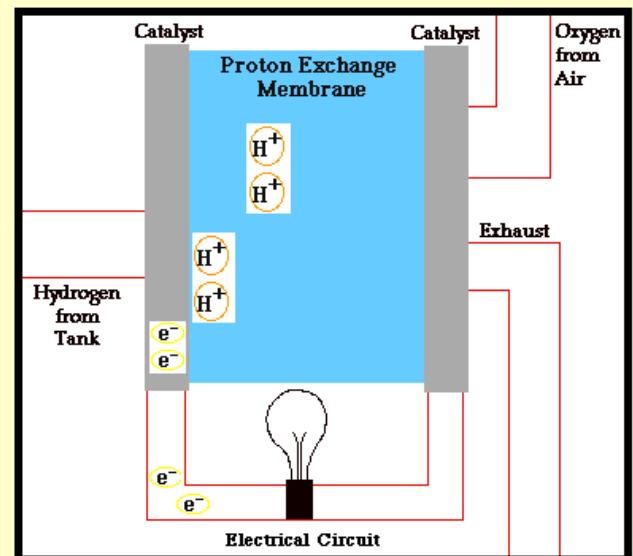
- » MNRE should set up a specific Renewable Purchase obligation (RPO) targets for each state just like it does for solar.
 - Note: Currently, there are two types of RPOs - Solar and Non-Solar
- » **Feed in Tariffs:** Discoms can adopt feed-in tariff (FiT) regulations and make offshore wind power procurement mandatory.
- » **Skill Development** - Capacity building programs, vocational training, and educational initiatives should be implemented to develop a skill workforce for offshore wind energy.
- » **Infrastructure Building:** Initiatives to promote domestic manufacturing and supply chain management.
- » **Environmental Impact Assessment and mitigation** to prevent environmental degradation and protect biodiversity.

6. HYDROGEN ENERGY

1) HYDROGEN FUEL CELL

- **Introduction**
 - » Hydrogen is the simplest fuel. A fuel cell combines hydrogen and oxygen to produce electricity, heat and water.
- **Fuel Cell**
 - » A fuel cell is a device that **converts chemical potential energy (energy stored in the molecular bonds) into electrical energy.**
 - A Proton Exchange Membrane (PEM) cell uses hydrogen (H₂), and Oxygen (O₂) as fuel.
 - The products of the reaction are water, electricity and heat.
 - » **Key Elements of a fuel cell**
 - **The anode**, the negative electrode of the fuel cell, conducts the electrons that are fed from the hydrogen molecule so that they can be used in the external circuit.
 - **The Cathode**, the positive post of the fuel cell, has channels etched into that distribute the oxygen to all surface of the catalyst. It also conducts electrons back from the external circuit to the catalyst, where they can recombine with hydrogen ion and oxygen to form water.
 - The **electrolyte** is a **proton exchange membrane**. This specially treated material, which looks something like ordinary kitchen plastic wrap, only conducts positively charged ions. The **membrane blocks electrons**.
 - **The catalyst** is a special material that facilitates the reaction of oxygen & hydrogen. It is usually made up of platinum nano particles very thinly coated onto carbon paper or clothe.
- **How does a fuel cell work?**

- » Hydrogen from a tank onboard the vehicle, enters into anode side of the fuel cell.
- » Oxygen pulled from air enters from cathode side
- » **As the hydrogen molecule encounters the membrane, a catalyst forces it to split into electron and proton.**
 - The proton moves through fuel cell stack and the electron follows an external circuit, delivering current to the electric motor and other vehicle components.
 - At cathode side, the proton and electron join again, and they combine with oxygen to form the vehicle's only tailpipe emission, water.



- Advantages of Hydrogen Fuel Cell

- » Fuel cell avoids the "thermal bottleneck" (a consequence of 2nd law of thermodynamics) and are thus inherently **more efficient than combustion engines**, which must first convert chemical potential energy into heat, and then mechanical energy.
- » Hydrogen is high in energy.
- » Fuel cells **don't have any moving part** and thus are more reliable than traditional engines.
- » **No pollution** (Only steam (H₂O) emitted as by product)
- » **No Greenhouse gas and Climate Change** (since no GHG are produced as bi-products)
- » **Ends dependency of Li-Ion batteries** (Please note for Lithium we are almost completely import dependent)

- Limitation

- » Complex and difficult to build
- » Still mostly in research phase
- » Extracting hydrogen is difficult and expensive - **catalyst used is Platinum-** which is very expensive.

A) FUEL-CELL ELECTRIC VEHICLES (FCEVs)

- » FCEV combine hydrogen and oxygen to produce electricity which runs the motor.
 - E.g.s of cars using FCEV: Toyota's Mirai, Honda's Clarity, and Hyundai's Nexo.
- » Since they are powered entirely by electricity, **FCEVs are considered EVs**, but unlike BEVs, their range and refueling processes are comparable to conventional cars and trucks.
 - The **major difference** between a BEV and a refueling time of just five minutes, compared to 30-45 mins charging for a BEV.

- Also, consumers get five times better energy storage per unit volume and weight, which frees up a lot of space for other things, while allowing the rider to go farther.
- » India's first indigenously developed Hydrogen Fuel Cell (HFC) technology bus was unveiled in Aug 2023, with the fuel cell - which uses hydrogen and air to generate electricity onboard to power the bus - being developed jointly by CSIR and Pune based automotive software company KPIT Ltd (Aug 2023)

B) TYPES OF ELECTRIC VEHICLES: EV/BEV, HEV, PHEV, FCEV

- **Electric Vehicles:** The standard EV is also known as **Battery powered EV (BEV):**
 - » They don't have an internal combustion engine and instead of an petrol/diesel, these vehicles run solely on battery power. These can be charged at home or commercial charging stations.
- **Hybrid Electric Vehicles (HEVs):** They run on both Internal Combustion Engines and electric motor that uses energy stored in a battery. However, unlike other EVs, HEV cars battery is charged by regenerative braking.
 - » **Micro (or mild) Hybrid** uses both battery and electric motor to make the car run. Though they can't run solely on electric power, they maximize fuel economy by shutting off the internal combustion engine during complete stops.
- **Plug-in Hybrid Electric Vehicles (PHEV):** They expand the concept of HEVs. They have both an internal combustion engine and a battery powered electric motor. This allows the battery to store enough power to feed the electric motor and in turn decrease the gas usage by as much as 60%. They can travel around 60 kms on electric power, rather than 2-3 kms with a standard HEVs.
- **FCEV:** already discussed above.

2) HYDROGEN ENERGY

- **Hydrogen Energy** is a clean and efficient form of energy derived from Hydrogen (H₂). It has the potential to replace fossil fuels.
 - » Hydrogen can be produced from variety of sources including water, natural gas, and biomass.
 - » There are two main ways to produce Hydrogen:
 1. **Steam Reforming:** This process uses heat and steam to break down natural gas into hydrogen and carbon mono-oxide.
 2. **Electrolysis:** This process uses electricity to split water molecules into hydrogen and oxygen.
 - » **Cost of producing hydrogen** varies depending on the various methods used.
- It can be used in two primary ways:
 - » **Direct Burning** to produce heat and water.
 - » **Fuel Cell Route** to directly produce electricity.
- **Advantages of Hydrogen Fuel:**
 - » **Abundance:** It is the most abundant element in the Universe.

- » **Energy Density** -> High
- » **Can contribute to achieving Net Zero by 2050**
- » **No Pollution** (only releases water)
- » **Leading options for storing energy from renewables.**
- » **Advantages of Hydrogen Vehicles (Fuel cell Stack) over other Electric Vehicles (Lithium-ion batteries))**
 - A fuel cell electric vehicle can be refueled in just 5 minutes. EV takes 30-45 minutes for charging.
 - **Energy storage per unit volume and weight is higher** in fuel cells than other types of electric vehicles.
 - **EV battery materials are controlled by a few larger players**. Scaled up hydrogen fuel cell will bring countries on equal footing.
 - **EV batteries** (like Lithium ion batteries) have still not been found viable for heavy vehicles like trucks.
- To get support in **Regulatory Framework** - the MoRTH in 2020 have issued a notification proposing amendments to the Central Motor Vehicle Rules, 1989, to include safety evaluation standards for hydrogen fuel cell-based vehicles.
- **Some limitations of Hydrogen fuel**
 - » **Hydrogen molecule is not available in abundance** on earth and is found in combination with other elements.
 - Thus, **external energy source** is required to isolate hydrogen. If coal or other fossil fuel is used for this extraction, it is called grey hydrogen and has carbon footprint.
 - » Hydrogen technology is "yet to be scaled up". Tesla CEO Elon Musk has called fuel cell technology "mind-bogglingly stupid".
 - » **Lack of fueling station infrastructure**
 - There are fewer than 500 operational hydrogen stations in the world today, mostly in Europe.
 - » **Safety is a concern.**
 - Hydrogen is pressurized and stored in a cryogenic engine. Some companies like Toyota and Hyundai have said that safety and reliability of hydrogen fuel tanks is similar to that of standard CNG engines.
- **Note: Various types of Hydrogen:** The most common element in nature is not found freely. It exists only combined with other elements and has to be extracted from naturally occurring compounds like water (which is a combination of two hydrogen atoms and one oxygen atom). This process is energy intensive.
 - » **Grey Hydrogen**
 - Hydrogen produced from fossil fuels. This constitutes a bulk of hydrogen produced today.
 - » **Blue Hydrogen**
 - Hydrogen generated from fossil fuels with carbon capture and storage options.
 - » **Green Hydrogen**

- Hydrogen generated entirely from renewable power sources. Here electricity generated from renewable energy is used to split water into hydrogen and oxygen.
- For e.g., a IIT-Madras team generated hydrogen from seawater using solar energy. (June 2023)

A) NATIONAL GREEN HYDROGEN MISSION

- **Ministry:** MNRE
 - With a vision to make India an energy independent nation, and to decarbonize critical sectors, the Government approved National Green Hydrogen Mission on Jan 4, 2023 with an initial outlay of Rs 19744 crores upto 2029-30.
 - The mission will facilitate demand creation, production, utilization, and export of Green Hydrogen and mobilization of Rs 8 lakh crores of investment by 2030.
 - **Likely Outcomes by 2030:**
 1. **Green Hydrogen Production Capacity** of at least 5 MMT (Million Metric Tonne) per annum.
 2. **Reduction in fossil fuel imports** by over Rs 1 lakh crores and creation of over 6 lakh jobs.
 3. **Renewable Energy Capacity Addition** of about 125 GW and abatement of nearly 50 MMT of annual GHG emissions.
 - **Interventions:**
 1. Under the **Strategic Interventions of Green Hydrogen Transition (SIGHT) Program**, two distinct financial incentive mechanisms - targeting domestic manufacturing of electrolyzers and production of Green Hydrogen - will be provided under the mission.
 2. **Regions capable of supporting large scale** production and/or utilization of hydrogen to be developed as Green Hydrogen Hubs.
 - **Policy Framework:**
 1. **Development of an enabling policy framework** to support establishment of Green Hydrogen Ecosystem.
 2. **Robust Standards and Regulations Framework**
 3. **Public Private Partnership** framework for R&D (**Strategic Hydrogen Innovation Partnership - SHIP**) will also be facilitated under the mission.
 4. **Skill Development Program**
- » **Several Pilot Projects** by PSUs like OIL, NTPC etc. have been initiated for the production of Green Hydrogen.

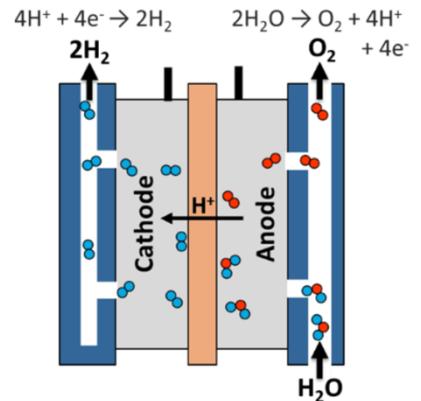
B) GOVERNMENT UNVEILS GREEN HYDROGEN STANDARDS (AUG 2023)

- It outlines the emission threshold for production of hydrogen that can be classified as 'green'.

- » Well-to-gate emission of not more than 2 kg CO₂ for per Kg H₂.
 - The well-to-gate emission include water treatment, electrolysis, gas purification, drying and compression of Hydrogen.
 - The scope of the definition encompasses both electrolysis based and biomass-based hydrogen production methods.
- » A detailed methodology of measurement, reporting, monitoring, on-site verification and certification of green hydrogen and its derivatives will be specified by the Ministry of new and renewable energy.
- » Bureau of Energy Efficiency (BEE) under the MoP will be the nodal authority for accreditation of agencies for the monitoring, verification, and certification of green hydrogen production projects.
- **Significance:**
 - » The definition of green hydrogen brings a lot of clarity to the mission of making India a global green hydrogen hub.

C) ELECTROLYSERS:

- Electrolysers are a critical technology for the production of low-emission hydrogen from renewable or nuclear electricity.
 - **Note:** Electrolysis is the process of using electricity to split water into hydrogen and oxygen. This reaction takes place in a unit called an Electrolysers.
- **How does it work?**
 - Like fuel cells, Electrolysers consist of an anode and a cathode separated by electrolyte. Different electrolyzers function in different ways, mainly due to the different type of electrolyte material involved in the iconic species it conducts.
 - The cost of electrolyzers and electricity (fuel) make up the largest share of the production cost, and thus developing more efficient electrolyzers will give a major boost to green hydrogen generation in India.
- **Some Recent Developments:**
 - IIT Madras develops a cost-effective way to electrolyze sea water to generate hydrogen:
 - **Challenges of traditional electrolyzers:**
 - Energy Intensive
 - Use of expensive oxide-polymer separator
 - Wastage of fresh water
 - **IIT Madras team** has addressed all these challenges by developing simple, scalable and cost effective alternatives that are highly efficient in splitting seawater and generating hydrogen.
 - They use alkaline sea water.



- They use carbon based support material for the electrodes instead of metals to almost eliminate the possibility of corrosion.
- They have developed a cellulose based separator that is very economic and serves the purpose of allowing hydroxide ions to pass through put prevent oxygen and hydrogen that are generated from crossing over.

D) HYDROGEN-CNG (H-CNG)

- In Sep 2020, MoRT&H has notified hydrogen-enriched compressed natural gas (CNG) as an automobile fuel.
- In Oct 2020, **Delhi became the first city in India to operate buses running on hydrogen spiked compressed natural gas (H-CNG)** in a six-month pilot project.
 - » The buses are running on a new technology patented by Indian Oil Cooperation for producing **H-CNG - 18% hydrogen in CNG - directly from natural gas** without resorting to conventional blending.
- **What is H-CNG?**
 - » It is an hydrogen enriched compressed natural gas. The ideal hydrogen concentration is 18%.
 - In **Delhi**, instead of physically blending hydrogen with CNG, hydrogen spiked CNG will be produced using a compact reforming process patented by IOC.
- **Advantages of H-CNG over CNG**
 - » **Less Air Pollution**
 - Emits 70% less CO₂
 - Reduces total hydrocarbons emissions by around 15% and increases fuel efficiency by 3-4%.
 - » **Increases fuel efficiency**
 - » **Higher power output**
- **Updates in Sep 2021**
 - » **CNG to HCNG model 'Capital intensive'**; Delhi government unlikely to scale up pilot project.
- **Way Forward: Following are the essential actions to ensure the launch of hydrogen economy in India**
 - » **Promote Demand**
 - Identify high demand sectors like green ammonia, oil-refining, heavy duty transport etc. where initial demand can be catalysed via public incentives.
 - **Pioneer voluntary purchase mechanisms** for green hydrogen embedded products such as green steel or green fertilizers similar to RE100 initiatives, where corporates like Infosys or google pledged to run completely on green energy.
 - » **Reduce cost of production of green hydrogen:**
 - **Work towards reducing renewable energy tariffs** -> 70% of the cost of production of green hydrogen is the cost of renewable energy.
 - **Scale:** India should strive to **incentivise the giga-scale production of green hydrogen components**, like electrolyzers, to take advantage of the global demand-supply gap and reduce the local green hydrogen prices.

- » India should **identify hydrogen production clusters closer to the renewable parks** to utilise near-zero cost excess peak power which can be diverted to hydrogen plants
- » **Promote R&D:** Policymakers must facilitate investments in early-stage piloting and the research and development needed to advance the technology for use in India.
- » **Focus on Domestic Manufacturing:**
 - Establishing an end-to-end electrolyser manufacturing facility will require more steps than just an PLI scheme. India needs to secure the supply of raw material that are needed for this technology.
- » **In the initial phase, Blend Green Hydrogen with Grey Hydrogen** (as grey hydrogen is much cheaper to produce)
- » **Plan for large scale refuelling network**
- » **Start on pilot basis for gated infrastructure like airports, ports, warehouses.**

- **Conclusion1**

- » Scaling up the technology and achieving critical mass remains a big challenge. More vehicles on the road and more supporting infrastructure can lower costs. **India's proposed mission** is seen a step in that direction.

- **Conclusion2:**

- » Even before it has reached any scale, green hydrogen has been anointed the flag-bearer of India's low-carbon transition. Hydrogen may be lighter than air, but it will take some heavy lifting to get the ecosystem in place.

7. BIOFUELS

1) BIO-FUEL BASICS

- **Example Questions**
 - i. Discuss the key advantages of Biogas. What are the key initiatives by government of India to promote the creation of biogas plants in the country. [10 marks, 150 words]
 - ii. '*Promoting biofuels in India is of strategic importance*' Discuss in light of the National Biofuel Policy 2018. [15 marks, 250 words]
 - iii. Discuss the 3 generations of biofuels and their advantages and disadvantages. [10 marks, 150 words]
 - iv. "National Biofuel Policy is trying to balance India's food security & energy security with farmer's income security". Discuss. [12.5 marks, 200 words]
- **Introduction**
 - Biofuel is a fuel that is produced through contemporary biological processes, such as agriculture and anaerobic digestion, rather than fuel produced by geological processes such as those involved in the formation of fossil fuels.
 - They are made from recently grown biomass (plant or animal matter). They are **renewable** because the source is continuously replenished.
 - E.g., Biogas, bioethanol, biodiesel etc.
 - **Biogas** is the biofuel produced through anaerobic digestion of organic waste.

- **Bioethanol** is an alcohol made by fermentation, mostly from carbohydrates produced in sugar or starch crops such as corn, sugarcane, or sweet sorghum.
 - **Cellulosic biomass**, derived from non-food sources, such as trees and grasses, is also being developed as a feedstock for ethanol production.
 - **Ethanol** can be used as a fuel for vehicles in its pure form, but it is usually used as a gasoline additive to increase octane and improve vehicle emission.

- **Generations of Biofuel (3 important)**

- i. **1G Biofuel:** They are produced directly from food crops such as wheat, sugar, vegetable oil and even animal fat etc.
 - Advantages includes known simple tech, cost competitiveness with fossil fuels etc.
 - Criticisms include food vs fuel debate etc.
 - They are also known as conventional biofuels. Most common first generation bio fuels include:
 - **Biodiesel:** Extraction of vegetable oils (both edible and non-edible), with or without esterification, from seeds of plants like soybean, rape (canola) and sunflower.
 - **Bioethanol:** Fermentation of simple sugar from sugar crops (sugarcane) or starch crops (corn, wheat etc).
 - It accounts for around 2/3rd of total biofuel production in the country.
 - **Biogas:** Anaerobic fermentation of organic waste and crop residue as energy crops.
- ii. **2G Biofuels:** Produced from non-food organic crops such as wood, organic waste, food crop waste and specific biomass crops. It includes use of non-food-crops technologies like jatropha-based fuels.
 - The advantages include use of wasteland, less impact on food security.
 - There are some limitations including high capital cost, advanced conversion technologies etc.
 - One well known second-generation technology is Lignocellulosic processing which uses forest material.
- iii. **3G Biofuels:** The source is based on improvements in the production of biomass.
 - They are produced from micro-organisms like algae
 - Algae act as low cost, high-energy and entirely renewable feedstock. It has impressive diversity and higher yield. Advantages include the ease of generating the biomass anywhere where sunlight and carbon is present.
 - Third generation biofuel has the potential to be more sustainable and have a lower environmental impact than first and second generation biofuels.
 - Some limitations include still developing tech, high technology cost, some poisonous algae etc.
- iv. **4th and 5th Generation Biofuels**
 - A. **Fourth Generation:**
 - It takes the advantage of biotechnology to engineer special crops such as algae (sometimes called oilgae) for biomass production. The aim is to engineer

microorganisms to produce biofuels more efficiently, with higher yields, and with lower environmental impacts.

B. 5th Generation Biofuels

- They are known as **electro fuels**. They are produced from microbial synthesis using renewable energy sources. In this process, micro-organisms use electricity as an energy source to convert carbondioxide into liquid fuels, such as ethanol or butanol.

Note: 4th Generation and 5th Generation Biofuels are in the early stage of development.

- Current Capabilities:

- As of Feb 2023, India has a biofuel power generation capacity of 10.77 GW.
- According to International Energy Agency (IEA), India is expected to overtake China to become third largest producer of ethanol by 2023.
 - Note: USA is the largest ethanol producer in the world accounting for 46% of global production and 2nd largest in biodiesel production accounting for 19% of the production.

- Targets:

- **National Biofuel Policy, 2018** (as amended in 2022): Country wide blending target of 20% ethanol by 2025 and 5% biodiesel by 2030

- Why growth of biofuel sector in India?

- The spurt in ethanol production in India is almost entirely policy driven. Initiatives like Ethanol Blending Program, National Biofuel Policy etc. have created conditions for the growth in the sector.

- Advantages of Biofuels

- i. **Renewable and Energy Security:** Biofuels reduce dependency on imports and thus also reduces India's vulnerabilities to price fluctuations.
- ii. **Fighting Pollution:**
 - Ethanol blended petrol reduces emission of pollutants like carbon monoxide.
 - Biogas is a much better fuel than cow-dung cake. It can also reduce the problems of poor sanitation.
 - Further, bio fuels helps in moving towards newer vehicle emission targets (BS-IV and BS-VI).
- iii. **Reduction in Greenhouse gases:**
 - A report by NITI Aayog quotes potential reduction of GHG emission at the point of use, i.e. from the tailpipe of the vehicle.
- iv. **Lesser impact on climate change**
 - Biogas also reduces the emission of GHGs such as methane and Carbondioxide.
- v. **Can Promote sustainable agriculture:**
 - Government is promoting farmers to move from water intensive crops like wheat and rice to Maize which is suitable for biofuel production.
- vi. **Increase farmer's income**

- By providing them another way to use their surplus crops.

vii. **Sanitation**

- Some biofuels like biogas can play an important role in dealing with the problems of open defecation and sanitation in rural and semi-urban areas.

viii. **Social impacts**

- Biofuels like biogas can reduce the drudgery of women involved in collecting fuel wood and thus plays a role in women empowerment.

ix. **Reduces Import Dependency and saving foreign exchange**

- **Some Criticisms:**

- **Land Use Change** to grow biofuel crops may have its own negative impact.
 - For e.g. the constant increase in demand from sugarcane based ethanol from Brazil has meant extensive deforestation of rainforests resulting in GHG emissions from Brazilian ethanol use that was about 60% higher than petrol.
- **Food Security Issues:** The argument that only surplus sugarcane and rice are diverted to fuel production may not hold in the longer term.
- **Water Challenges** - Sugarcane is a water intensive crop.

- **Steps taken by government to support biofuels**

- National Policy on Biofuels, 2018**
- Pradhan Mantri Ji-Van Yojana (PMJY)**
- Oil CPSEs are setting up 2G ethanol bio-refineries** in the country at Panipat (Haryana), Bathinda (Punjab), Numaligarh (Assam), Bargarh (Odisha) and one demonstration project at Panipat..
- EBP and associated steps**
- National Bio-Energy Program (FY 2021-22 to 2025-26):**
 - It comprises of the following schemes:
 - Waste to Energy Programme (Program on Energy from Urban, Industrial, and Agricultural Wastes/ Residues)** to support setting up of large biogas, BioCNG, and Power Plants (excluding MSW to Power projects)
 - Biomass Programme (Scheme to support manufacturing of Briquettes & Pellets and Promotion of Biomass (non-bagasse) based congregation in Industries)** to support setting up of pellets and briquettes for use in power generation and non-bagasse based power generation projects.
 - Biogas Programme** to support setting up family and medium Biogas in rural areas.

vi. **Biogas Promotion**

vii. **Advisory to carmakers to introduce flexible fuel engines in Vehicles:**

viii. **International Collaboration:** For e.g. the Global Biofuel Alliance (GBA) is one of the top priorities under India's G20 presidency.

- Brazil, India and the USA, as leading biofuel producers and consumers of the world have agreed to work together towards the development of this alliance along with other interested countries.
- This alliance will work towards facilitating cooperation and intensifying the use of sustainable biofuels, including in the transportation sector.

- **Way forward:**

- The proposed expansion of 1G biofuel need to think about broader land use strategies by developing clear and detailed criteria for identifying land suitable for energy crops.
 - Crucial factors like GHG emissions, local pollution, food security, land laws, and resource availability must also be considered.
 - For 2G Biofuels -
 - Locating the industries near feedstock availability: It is important to map feedstock location and then plan biofuel production capabilities.
 - More R&D: Scope for the schemes like Pradhan Mantri JI-VAN Yojana needs to be expanded, and international grants and loans should be redirected towards 2G fuels.
 - India also needs to develop alternative feedstock for biodiesel production.
 - Millions of tonnes used cooking oil can be channelized here.
- Conclusion:
- Thus, the expansion of the biofuel sector needs to be multipronged and rooted in sustainability.

2) ETHANOL BLENDING

- Process of mixing ethanol with Petrol is called Ethanol blending. The mixture is called as Ethanol Fuel/Gasohol which is considered as a quasi-renewable energy.
- In India, the practice of blending ethanol was started in 2001. Ethanol blending was first time mentioned in the Auto Fuel Policy of 2003.
- Benefits of Ethanol Blending
 - Reduces vehicular emissions especially CO (Carbon Monoxides) emissions.
 - It is cheaper than petrol as it is easier to manufacture.
 - It reduces our import dependency.
 - Trade balance, foreign exchange etc.
 - Ethanol has higher octane rating than ethanol-free petrol
 - In case of India Ethanol production can generate higher sugarcane prices for farmers.
- Ethanol Blended Petrol (EBP) Program was launched by the Government in 2003, and was aimed at promoting 5% blending of molasses-based ethanol with petrol, to promote the use of alternative and environment friendly fuels, to reduce import dependency for energy requirements and to increase value addition to Sugar industry enabling them to clear cane price arrears of farmers.
- Central Financial Assistance (CFA) for biomass power projects includes installations from biomass combustion, biomass gasification and bagasse co-generation.
- Allowing conversion of surplus stock of rice with FCI and Maize to Ethanol.
 - In June 2021, central government allocated 78,000 tonnes of rice from FCI for ethanol production.
- Cabinet keeps on reviewing the prices for procurement of ethanol by public sector Oil Marketing Companies, to ensure better prices for farmers.

3) NATIONAL POLICY ON BIOFUELS

- **Aims**
 - » Reduce India's oil import dependency.
 - » Provide better income opportunities to farmers by helping them dispose of their surplus stock in economic manner.
- **Key Highlights**
 - » **Aim (as amended in 2022):** Country wide blending target of 20% ethanol by 2025 and 5% biodiesel by 2030.
 - » **Categorization of Biofuels to enable extension of appropriate financial and fiscal incentives under each category.**
 1. **Basic Biofuels** viz. First Generation (1G) bioethanol and biodiesel
 2. **Advanced Biofuels** - Second Generation (2G) Ethanol, Municipal Solid Waste to drop-in fuels, Third Generation (3G biofuels), bio-CNG etc.
 - » **Expands the scope of raw material for ethanol production**
 1. Allowing use of sugarcane juice, sugar containing materials like Sugar Beet, Sweet Sorghum, starch containing materials like Corn, Cassava, Damaged Food grains like wheat, broken rice, Rotten Potatoes unfit for human consumption for ethanol production.
 - » **Allows use of surplus food grains for production of ethanol** for blending with petrol
 - » **A VGF for 2G Ethanol bio-refineries of Rs 5,000 crore in 6 years** in addition to additional tax incentives, higher purchase price as compared to 1G biofuels.
 - » The new policy encourages setting up of supply chain mechanisms for biodiesel production from non-edible oilseeds, used cooking oil, short gestation crops.
 - » **Specifies the role of all the concerned ministries/ Departments** with respect to biofuels
- **2022 Amendment:**
 - » Advance the deadline to reach the blending target of 20% bioethanol in petrol, from 2030 to 2025-26.
 - It will promote the production of biofuels in the country, under the Make in India program, by units located in SEZs/Export Oriented Units (EOUs).
 - » Make additional feedstocks eligible for the production of biofuels.
- **Analysis: Expected Benefits**
 - The new policy addresses **the supply side issues** that had discouraged the production of biofuels within the country.
- **Conclusion**
 - Biofuels in India are of strategic importance as it augurs well with the ongoing initiatives of the Government such as Make in India, Swachh Bharat Abhiyan, Skill Development and offers great opportunities to integrate with ambitious target of doubling farmers' income, import reduction, employment generation, waste to energy creation.

4) BIO-CNG (COMPRESSED BIOGAS)

- It is an upgraded version of biogas (the dung-based version of which serves as cooking fuel in many villages in India).
- **How Bio-CNG is produced?**
 - » **Pre-Treatment:** The waste is passed through a filter to remove hard material like Coconut shells and pieces of wood.
 - » **Shredding:** the waste is shredded in a hammer mill and made into a slurry with water.
 - » **Hydrolysis:** The slurry is kept in the pre-digestor tank in aerobic conditions for one-two days to attract microbes - the process is called **hydrolysis**.
 - » **Methanogenesis:** After hydrolysis the slurry is transferred to anaerobic digester where it is retained for 20-25 days. It is during methanogenesis that biogas is generated. This gas contains 65% methane, while the rest is Hydrogen Sulphide, carbondioxide, and water vapour.
 - » **Purification:** The above gas is passed through a wet and dry scrubber to remove hydrogen sulphide and CO₂. Methane, purified upto 95% is obtained here which is then compressed at high pressure in cylinders and send to filling stations. This highly purified methane is similar in chemical properties to CNG derived from petroleum sources and can thus be used in vehicles.
- **Advantages:**
 - » **Renewable:** The energy source is renewable and thus reduces India's import dependency while ensuring **Atmanirbharta and Make in India**.
 - » **Swatch Bharat:** The production of Bio-CNG from biodegradable waste, agricultural residue, cow dung and chicken litter etc. can contribute to sanitation goals.
 - » **Fighting Air Pollution:**
 - Bio-CNG helps deal with air pollution on three levels - curtail methane emission, ward-off waste burning and phase out fossil fuel powered vehicles.
 - For e.g. the CBG plant inaugurated in Sangrur, Punjab will soon be processing 300 tons per day of paddy straw and produce 33 tonnes per day of CBG.
 - » **Strengthening Rural Economy, organic farming** -> **More income to farmers and More jobs in rural areas**
 - » **Decentralized energy** as it is produced closest to the point of consumption.
 - » **No Intermittency** like solar and wind as CBG could be produced at all hours.
- **Limitation:**
 - » **Maintenance cost** of Bio-CNG based vehicles is higher.
 - » Further, users have complained that calorific value of Bio-CNG is lower than CNG as it contains moisture.
 - » **Biogas plants** are also sometimes seen as methane bombs as any emission of leak from digestor or pipelines can contribute to climate change significantly.
- **Government Initiatives:**
 - » **SATAT (Sustainable Alternative Towards Affordable Transport)** Initiative:
 - Launched in 2018, it aims to promote production and use of Bio-CNG (Compressed Bio-GAS) in India. Under it, government sets up compressed Biogas (CBG) production plants and make available CBG in the market for use in automotive sector.
 - » **National Bio-Energy Program** (FY 2021-22 to 2025-26)
 - » Asia's largest compressed biogas plant was inaugurated in Sangrur by Union Minister Hardeep S. Puri.



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NOBEL PRIZES, 2023

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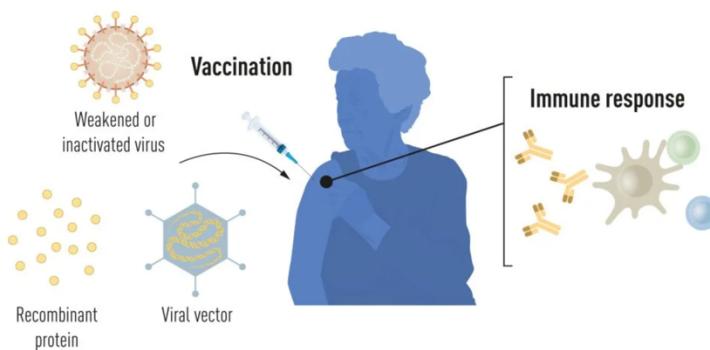
1) NOBEL AWARDS, 2023

- Nobel prizes are regarded as most prestigious awards given for intellectual achievement in the world. These are a set of six international awards.
 - » The will of Swedish Scientist Alfred Nobel established these prizes in 1895 and the first Nobel prize in Physics, Chemistry, Medicine, Literature and Peace were awarded in 1901.
 - » In 1968, Sweden's Central Bank Sveriges Riksbank established the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, which although not being a Nobel Prize, has become commonly known as the Nobel Prize in Economics.
- **About Alfred Nobel:**
 - » He is a 19th century businessman and chemist from Sweden. He held more than 300 patents. His most popular invention was dynamite which he created by mixing nitroglycerine with a compound that made the explosive more stable. The dynamite soon started getting used in construction as well as defence industry which made Nobel very rich.
 - » It perhaps also made him think about his legacy, because towards the end of his life he decided to use his vast fortune to fund annual prize "to those who, during the preceding year, have conferred the greatest benefit to humankind".
 - » For reasons that are not entirely clear, Nobel decided that peace prize should be awarded in Norway and other prizes in Sweden. Nobel historians suspect that Sweden's history of militarism may have been a factor.
- **Who awards these prizes?**
 - » The Royal Swedish Academy of Sciences awards the Nobel Prize in Physics, the Nobel Prize in Chemistry, and the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel.
 - » The Nobel Assembly, consisting of 50 professors at the Karolinska Institute, Stockholm, Sweden awards the Nobel Prize in Physiology or Medicine.
 - » The Swedish Academy grants the Nobel Prize in Literature.
 - » The Norwegian Nobel Committee awards the Nobel Peace Prize.
- **Nobel Prizes in 2023:**
 - » In Physiology or Medicine, the prize has gone to scientists Katalin Kariko and Drew Weissman, whose work enabled the development of mRNA vaccine against COVID-19.
 - » In Physics, the Nobel Prize has been awarded to Anne L'Huillier, Pierre Agostini, and Ferenc Krausz in the field of attophysics for developing flashes of light short enough to take snapshots of electrons.

- » In **Chemistry**, the Nobel Prize has gone to Moungi G. Bawendi, Louis E. Brus, and Alexei I. Ekimov for the discovery and synthesis of **Quantum Dots**.
 - » The Nobel prize in **Literature** has been awarded to Job Fosse, "for his innovative plays and prose which give voice to the unsayable".
 - » The Nobel Prize in **Economic Sciences** has been awarded to Claudia Goldin for research on the **workplace gender gap**.
 - » The **Nobel Peace Prize for 2023** has been awarded to Iranian activist Narges Mohammadi for her relentless fight against the oppression of women in Iran and her unwavering commitment to promoting human rights and freedom.
- **Prizes:**
- » \$1 million; 18-carat gold medal; and diploma

2) S&T: UNDERSTANDING VARIOUS TYPES OF VACCINES

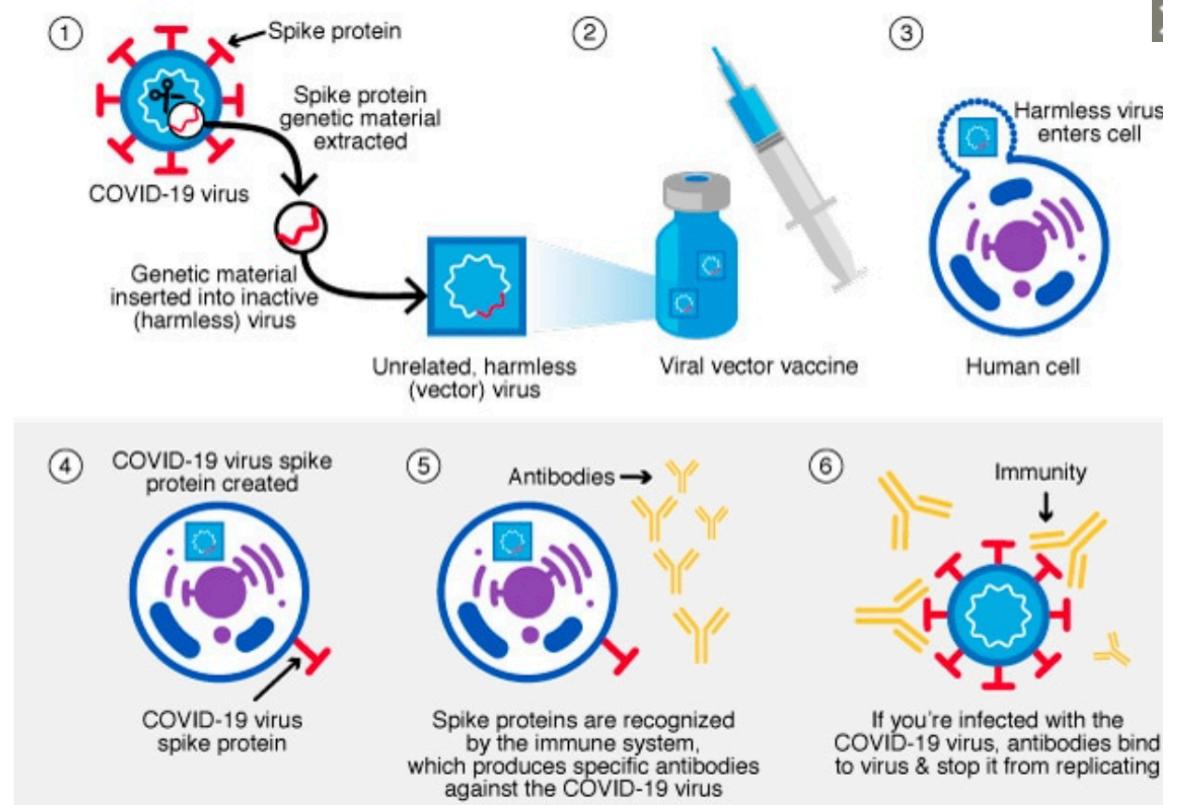
- **Live Attenuated virus vaccines** such as the combined rubella-mumps-measles vaccines and the yellow fever virus vaccine, induce robust and long-lived antibody and T-cell mediated immunity.
 - » **Note:** For the development of yellow fever vaccine, Max Theiler was awarded the Nobel Prize in Physiology or Medicine in 1951.
 - » These vaccines induce effective but transient immune responses, requiring repeated boosting.
 - » COVID-19 vaccine developed using this mechanism - Covaxin developed by Bharat biotech.
- **Viral Vector Vaccines:** It uses a safe virus (not harmful) which serves as a platform to produce target proteins to generate immune response.
 - » Such viral vector efficiently enters cells where the encoded antigen are produced by the bodies protein synthesis machinery.
 - The first example of a licensed viral vector vaccine was the Vesicular stomatitis virus - based vaccine against Ebola, approved in 2019, which was soon followed by an adenovirus-based Ebola vaccine.



- **During COVID-19** various vaccines
 - » **Oxford-AstraZeneca** (ChAdOx1 nCoV-19) used adenovirus route.

- Covishield used in India is a version of this.

» Sputnik V Vaccine also has gone adenovirus route.



- Both the above methods (live attenuated virus or viral vector vaccine) used cell culture-based manufacturing facilities which is resource intensive. Further they may also introduce diseases and is safer and stable than vaccine containing whole pathogens.
- Therefore, researchers have focused upon sub-unit vaccines that circumvent the need of large-scale cell cultures by delivering nucleic acid (DNA or mRNA) directly to vaccine recipients, exploiting the body's own capacity to produce proteins.
- **Subunit Vaccines:** (Protein subunit vaccines)
 - » Protein subunit vaccines include only the parts of virus that best stimulate immune system. These vaccines contain single protein components of the respective virus and are referred as subunit vaccine.
 - It includes Hepatitis B Vaccine (HBV) and Human papillomavirus (HPV) vaccine.
 - » **advantages:**
 - No risk of introducing the disease and is safer and stable than vaccine containing whole pathogens.
 - Suitable for immunocompromised individuals.
 - Well established tech

- » **Disadvantage**
 - Relatively complex to manufacture (compared to other vaccines like RNA vaccines)
 - May require multiple doses.

- » **COVID-19 vaccine** developed using this method:
 - **Corbevax** is a protein subunit COVID-19 vaccine developed by Texas Children hospital. It delivers spike protein to the body directly.
 - **How was protein manufactured?**
 - Add gene of spike protein into yeast to produce large number of proteins.
After isolating the virus spike protein from the yeast and adding an adjuvant, which helps trigger an immune response, the vaccine was ready.

- **DNA and RNA subunit vaccines:**
 - » **Advantages** of subunit vaccines (DNA or mRNA vaccines)
 - **Less Resource intensive** and thus easy to manufacture.
 - **More flexibility** - Since the sequence can be easily changed to encode different antigens.
 - This also makes iterative testing of new candidate vaccines and generation of updated vaccines rapid and efficient.

 - » **Initially DNA vaccine was thought to be more promising** but didn't translate into success. A likely reason for it was that injected DNA must cross two barriers, the plasma membrane and the nuclear membrane, to reach the cellular compartment where transcription takes place (DNA conversion to mRNA). In contrast, mRNA-based vaccines only need to gain access to the cell cytoplasm where translation takes place (mRNA conversion to protein)

 - » **Another advantage of mRNA vaccine:** Delivered nucleic acid can't integrate into the host genome. This is an additional safety aspect of this method.
 - **E.g of DNA vaccine** (developed for COVID-19):
 - **E.g for mRNA vaccine** (developed for COVID-19): Moderna COVID-19 (mRNA-1273) vaccine.

3) S&T: BIOLOGY/PHYSIOLOGY NOBEL PRIZE, 2023

- The 2023 Nobel Prize in Physiology or Medicine has been awarded to **Katalin Kariko (Hungary)** and **Drew Weissman (USA)** for their discoveries concerning nucleoside base modifications that enabled the development of effective mRNA vaccine against COVID-19. Through their groundbreaking findings, which have fundamentally changed our understanding of how mRNA interacts with our immune system, the laureates contributed to the unprecedented rate of vaccine development during the COVID-19 crisis.

- **Background:**
 - » **Other methods of vaccine development** - Whole Virus -, protein-, and vector- based vaccines requires large scale cell culture. It is a resource intensive process and limits the possibilities for

rapid vaccine production in response to outbreaks and pandemics. **mRNA based vaccines** solved these problems.

- During the 1980s, efficient methods of producing mRNA without cell culture were introduced, called in-vitro transcription. Ideas of using mRNA technologies for vaccine and therapeutic purposes also took off, but roadblocks lay ahead.
 - » In vitro transcribed mRNA was considered unstable and challenging to deliver. It required development of sophisticated carrier lipid systems to encapsulate the mRNA.
 - » This mRNA also gave rise to inflammatory reactions.
 - » These problems limited the enthusiasm for developing the mRNA technology for clinical purposes.
- **Contributions:**
 - » In 1990s, Kariko was an assistant professor at the University of Pennsylvania and met immunologist Drew Weissman there.
 - » They worked together to prevent the immune system from launching an inflammatory reaction against lab-made mRNA, previously seen as a major hurdle against therapeutic use of mRNA.
 - They found that inflammatory response was almost abolished when base modification was included in the mRNA. Therefore, in 2015 they published that adjustments (modifications) to nucleosides, can keep the mRNA under the immune system's radar.
 - Later, they also showed that the delivery of mRNA generated with base modification markedly increased protein production compared to unmodified mRNA. This effect was due to the reduced activation of an enzyme that regulates protein production.

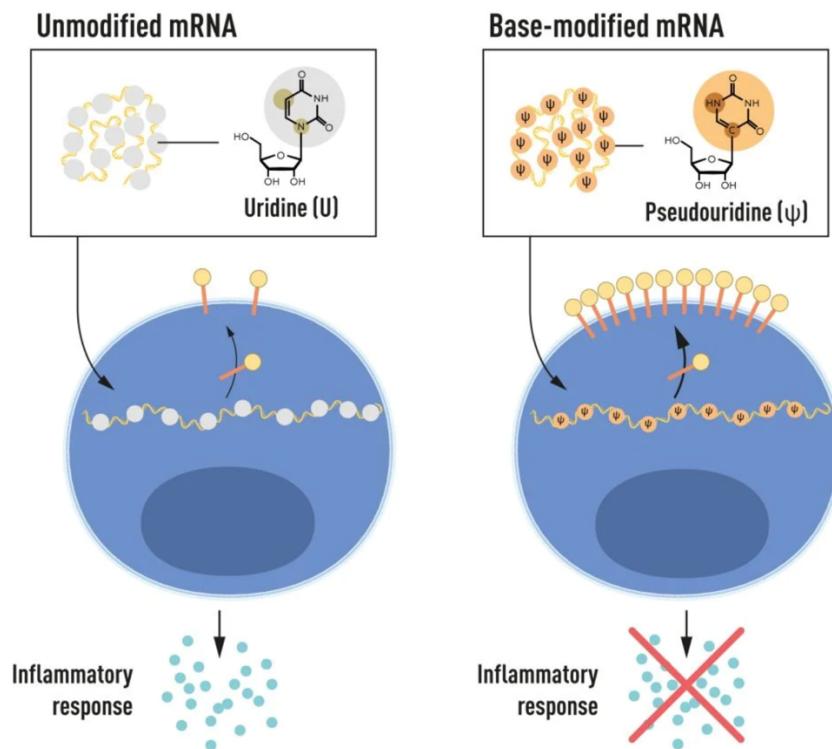


Figure 2. mRNA contains four different bases, abbreviated A, U, G, and C. The Nobel Laureates discovered that base-modified mRNA can be used to block activation of inflammatory reactions (secretion of signaling molecules) and increase protein production when mRNA is delivered to cells.

© The Nobel Committee for Physiology or Medicine. Ill. Mattias Karlén

- **Development of Vaccines:**

- After the above discoveries, interest in mRNA technology picked up. Vaccines for Zika and MERS-CoV were pursued.
- After the outbreak of COVID-19 pandemic, two base-modified mRNA vaccines encoding the SARS-CoV-2 surface protein were developed at record speed. Protective effects of around 95% were reported, and both vaccines were approved as early as Dec 2020.
- The impressive flexibility and speed with which mRNA vaccines can be developed pave the way for using the new platform also for vaccine against other infectious diseases.
- In the future, the technology may also be used to deliver therapeutic proteins and treat some cancer types.
- **How mRNA vaccine protects you against COVID-19:**

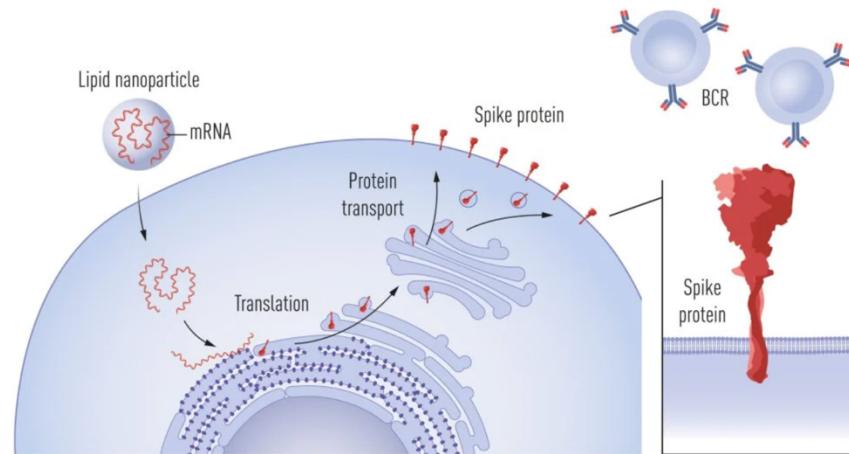


Figure 4. Spike production following mRNA vaccination and recognition of spike by B cells.

Following uptake of mRNA into cells, facilitated by lipid nanoparticles, the mRNA acts as a template for spike protein production. Spike is then transiently expressed on the cell surface, where it is recognized by B cells via their B cell receptors (BCRs), stimulating the secretion of spike-specific antibodies.

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- Through their fundamental discoveries of the importance of base modification in mRNA, this year's Nobel Laureates critically contributed to this transformative development during one of the biggest health crises of our time.

4) S&T: PHYSICS NOBEL PRIZE 2023

- **Quick Summary:**

- » Anne L'Huillier, Pierre Agostini and Ferenc Krausz have been awarded Nobel Prize in Physics, 2023.
- » **What did they do?**
 - Through their experiments, they have created flashes of light that are short enough to take snapshots of electrons' extremely rapid movements.
 - **Anne L'Huillier** discovered a new effect from laser light's interaction with atoms in a gas.
 - **Pierre Agostini** and **Ferenc Krausz** demonstrated that this effect can be used to create shorter pulses of light than were previously possible.

- **Background: Understanding the Problem:**

- » Human eyes cannot clearly see hummingbird's beating its wings which can be around 80 times per second. We are only able to perceive this as a whirring sound and blurred movement. It is because extremely short events are impossible to observe by human eyes.
- **High Speed photography** can capture detailed images of fleeting (short) phenomena. **A highly focused photograph of a hummingbird in flight requires an exposure time that is much shorter than a single wingbeat.**
- **The faster the event, the faster the picture needs to be taken if it is to capture the instant.**
- **Atom's** natural timescale is that of femtoseconds (10^{-15} sec). These movements can be studied with the very shortest pulses that can be produced with a laser.
 - A **femtosecond** was, in the 1980s, regarded as the limit for the flashes of light it was possible to produce.
- But, electrons natural timescale is further lower in **attoseconds (10⁻¹⁸ sec)** i.e. in the world of electrons, positions and energies change at speeds of between one and a few hundred attoseconds. Therefore, flashes of light produced at femtosecond was not enough to see processes occurring on the timescale of electrons.
- **Development of Attosecond Pulses:**
 - » The mathematics that describes waves demonstrate that any wave form can be built if enough waves of the right sizes, wavelengths, and amplitudes (distance between peaks and troughs) are used. The **trick to attosecond pulses** is that it is possible to make shorter pulses by combining more and shorter wavelengths.
 - » In 1987, Anne L' Huillier and her colleagues at a French laboratory passed an infrared laser beam through a noble gas. The beam's interaction with atoms in the gas produced overtones (overtones are waves of light whose wavelength was an integer fraction of the beam. For e.g, if the beam had a wavelength of 100, the overtones would have wavelength of 10, 25, 50 etc.)
 - By finetuning the setup used to produce the overtones, scientists realized that it should be possible to create intense pulses of light each a few attosecond long.
 - » In 2001, Pierre Agostini and his research group in France successfully produced and investigated a series of 250-attosecond light pulses, or a pulse train.
 - » At the same time, Ferenc Krausz and his team in Australia developed a technique to separate an individual 650 second pulse from a pulse train.
 - Using this researcher were able to measure the energy of some electrons released by some krypton atoms.
- **Applications of attosecond physics:**
 - » It allows scientists to capture images of activities that happen in incredible short spans. This can be used for exploring short-lived atomic and molecular processes implicated in fields like material, science, electronics, and catalysis.
 - » In **medical diagnostics**, attosecond pulses can be used to check for the presence of certain molecules based on their fleeting signatures.
 - » These pulses could also be used to develop faster electronic devices, and better telecommunication, imaging and spectroscopy.

5) S&T: CHEMISTRY NOBEL PRIZE: QUANTUM DOTS

- **Quick Summary:**

- » The **Royal Swedish Academy of Sciences** has decided to award the Nobel Prize in Chemistry, 2023 to:
 - Moungi G. Bawendi** (MIT, USA)
 - Louis E. Brus** (Columbia University, USA)
 - Alexei I. Ekimov** (Nanocrystals Technology Inc., New York, NY, USA)

"For the discovery and synthesis of "Quantum Dots".

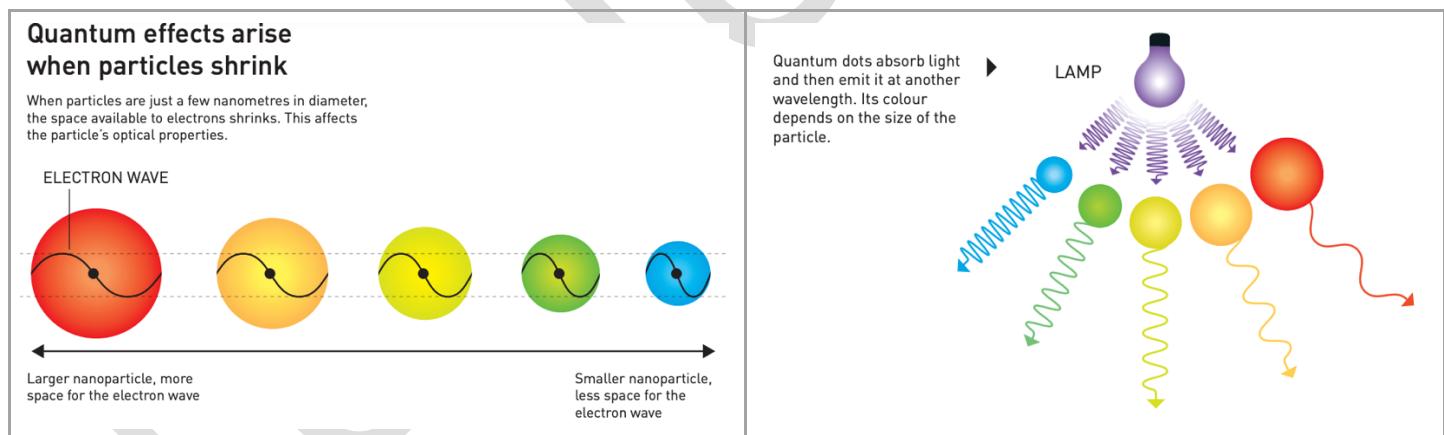
- **Details:**

- » **Quantum Dots** are nanoparticles so tiny that their size determines their properties.
 - **Understanding Size of Quantum Dots:**



A quantum dot is a crystal that often consists of just a few thousand atoms. In terms of size, it has the same relationship to a football as a football has to the size of the Earth.

- » **Understanding Properties:** They have many fascinating and unusual properties. Importantly, they have different colors depending on their size.



- **For decades**, Quantum phenomena in the nanoworld were just a prediction.

- **Contributions:**

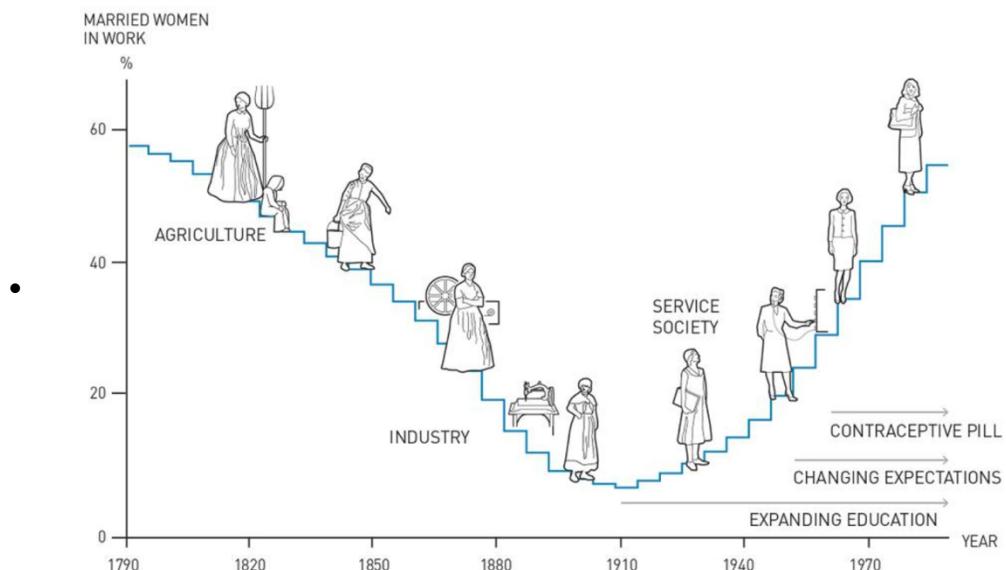
- » **In the early 1980s**, Alexie Ekimov and Louis Brus succeeded in creating - independently of each other - quantum dots, which are nanoparticles so tiny that quantum effects determine their characteristics.
 - **Alexie Ekimov**, in early 1980s, succeeded in creating size-dependent quantum effects in colored glasses.

- The color came from nanoparticles of copper chloride and Ekimov demonstrated that the particle size affected the color of the glass via quantum effects.
 - This was the first time someone had succeeded in deliberately producing quantum dots - nanoparticles that cause size-dependent quantum effects.
 - Louis Brus, a few years later, was the first scientist in the world to prove size-dependent quantum effects in particles floating freely in a fluid.
- » **Moungi Bawendi**, in 1993, revolutionized the chemical production of quantum dots, resulting in almost perfect particles. This high quality was necessary for them to be utilized in applications.
- **Applications:**
 - » Researchers have primarily utilized quantum dots to create colored light.
 - The luminous property of quantum dots is utilized in computer and television screens based on QLED technology, where the Q stands for quantum dot.
 - In these screens blue light is produced using the energy-efficient diodes that were recognized with the Nobel Prize in Physics 2014. Quantum dots are used to change the color of some of the blue light, transforming it into red or green. This makes it possible to produce three primary colors of light needed in a television screen.
 - » **LED Lamps**: Quantum dots are used in LED lamps to adjust the cold light of the diodes. The light can then become as energizing as daylight or as calming as the warm glow from a dimmed bulb.
 - » **Biochemistry and Biomedicine**: Biochemists attach quantum dots to biomolecules to map cell and organs. Doctors are also investigating the potential use of quantum dots to track tumour tissue in the body. Chemists instead use the catalytic properties of quantum dots to drive chemical reactions.
 - **Surgeries**: These can guide surgeons when they remove tumour tissues, among many other things.
 - » **Future Applications**: Researchers believe that in the future they could contribute to flexible electronics, tiny sensors, thinner solar cells, and quantum cryptography.
- **Conclusion:**
 - » Quantum Dots are bringing great benefits to humankind, and we have just begun to explore their potential.

6) ECONOMY NOBEL: WORKPLACE GENDER GAP

- **Why in news?**
 - » 2023 Nobel Prize in Economic Sciences awarded to U.S. economist Claudia Goldin for research on the workplace Gender Gap (Oct 2023)
- **Details:**
 - » **Claudia Goldin**, a professor at Harvard is only the third woman to ever be awarded the economic prize.
 - Earlier, Elinor Ostrom was awarded this in 2009 and Esther Duflo was awarded in 2019.
- **Key Contribution:**

- » She has studied 200 years of women participation in workplace in USA. Her work is the "first comprehensive account of women's earning and labour market participation through the centuries".
- » As per her, the most important in the unequal paradigm "is that both lose". Men are able to have the family and step up because women step back in terms of their jobs, but both are deprived. Men forgo family time and women often forego their career.
- » The most significant of her observation was that female participation in the labor market didn't exhibit an upward trend over the entire period, but rather a **U-Shaped curve**. In other words, economic growth ensuing in varied periods didn't translate to reducing gender differences in the labour market.



- How did female participation move between the agrarian and industrial era?
 - » The participation of married women decreased with the transition from an agrarian to an industrial society in the early nineteenth century.
 - The **female participation in labor force was incorrectly assessed** and stated in census and public data.
 - For e.g, a standard practice entailed categorizing women's occupation as "wife" in records. This was wrong because this identification didn't account for activities other than domestic labor such as working alongside husband in farms or family businesses, in cottage industry etc.
 - Thus, proportion of females in labor force was considerably greater at the end of the 1790s than was shown in the official stats.
 - **Prior to advent of industrialization** in the 19th century, women were more likely to participate in the labor force. This was because industrialization had made it harder for married women to work from home since they wouldn't be able to balance the demand of their family.

- The beginning of the 20th century marked the upward trajectory for female participation in the labor force:
 - Technological progress, the growth of the service sector and increased levels of education brought an increasing demand for more labor.
 - However, Social Stigma, legislation and other institutional barriers limited their influence.
 - Marriage Bars and Prevalent Expectations were two factors of importance there.
 - Marriage Bars refer to the practice of firing and not hiring women once married. This peaked during the 1930s Great Depression and the ensuing years - preventing women from continuing as teachers or officer workers.
 - Prevalent Expectations about their future careers. Women at varied points were subject to different circumstances when deciding on their life choices. Their decisions could be based on an assessment of expectations that might not come to fruition.
 - In the early 20th century for example, women were expected to exit the labor force upon marriage. When things turned marginally in the second half of the century, married women would return to the labor force once their children were older. However, this meant a reliance on educational choices that were made previously, as the author notes, at a time when they were not expected to have a career. The "underestimation" was overcome in the 1970s when young women invested more in education.
 - Introduction of birth control pills played a crucial role in creating conditions for women to plan their careers better. Though this influenced educational and career choices positively, it didn't translate into disappearance of the earning gap between men and women, though it became significantly smaller since the 1970s.
 - Pay Discrimination (i.e., employees being paid differently because of factors such as color, religion, or sex, among others) increased significantly with the growth of the services sector in the 20th century.
 - Source of Gap:
 - » Needing to combine paid work and family care needs.
 - » Decisions (and expectations) related to pursuing education and raising children.
 - » Technical Innovations
 - » Laws and norms
 - » Structural transformation in an economy.
 - Nobel laureate Claudia Goldin's hope for the future is that women have a career as well as a spouse who wants what they want.



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1. GENERAL STUDIES-2

1) SOCIAL JUSTICE: CASTE CENSUS

- **Why in news?**
 - » The Bihar government has released the results of its "Comprehensive Caste Survey" in the state (Oct 2023)
- **Background and Survey:**
 - » The Bihar legislature unanimously passed a resolution agreeing to a caste census, twice: first on Feb 18, 2019 and then on Feb 27, 2020. The Government of Bihar, in June 2022, issued a notification for conducting a caste survey in the state on its own and subsequently allocated Rs 500 crore from its contingency fund for the exercise.
 - » More than 3 Lakh people, mainly teachers, went from door to door with a 17 question form on caste, religion, and economic status. An app was used to collect the data for tabulation and processing.
- **Key findings of the survey Bihar Caste Census:**
 - » **Total Population:** 13.07 crores (10.41 crores in 2011 census)
 - » **Population Distribution** on the basis of Religion:

Group	% of Population
Hindus	81.99%
Muslims	17.72%
Buddhists, Christians, Sikhs, Jains, and other groups	Minuscule

- **Population Distribution** on the basis of Caste:

Group	Percentage Population
Backward Classes (EBCs (36.01%) + OBCs (27.12%))	63%
Scheduled Castes	19.65%
Scheduled Tribes	1.68%
Unreserved Category ("Forward Castes")	15.5%

- **Significance of Caste Census in Bihar:**

- » **Political Significance:** The results may present political parties like JD(U)-RJD with an opportunity for renewed backward class mobilization.
- » It is first such large scale exercise where results have been made public.
 - The states of TN and Karnataka, as well as Union Government itself (in an ill-fated SECC 2011), have collected comprehensive caste data in the past, but for reasons that remain unclear, never revealed it.
- » The survey results will amplify the clamor for increasing OBC quota beyond 27%, and for a quota within quota for the EBCs.
 - The Justice Rohini Commission, which had been examining the question of "sub-categorization" since 2017, submitted its report in last July - its recommendations are not public yet.
 - **Reopen debate on 50% ceiling on reservation:**

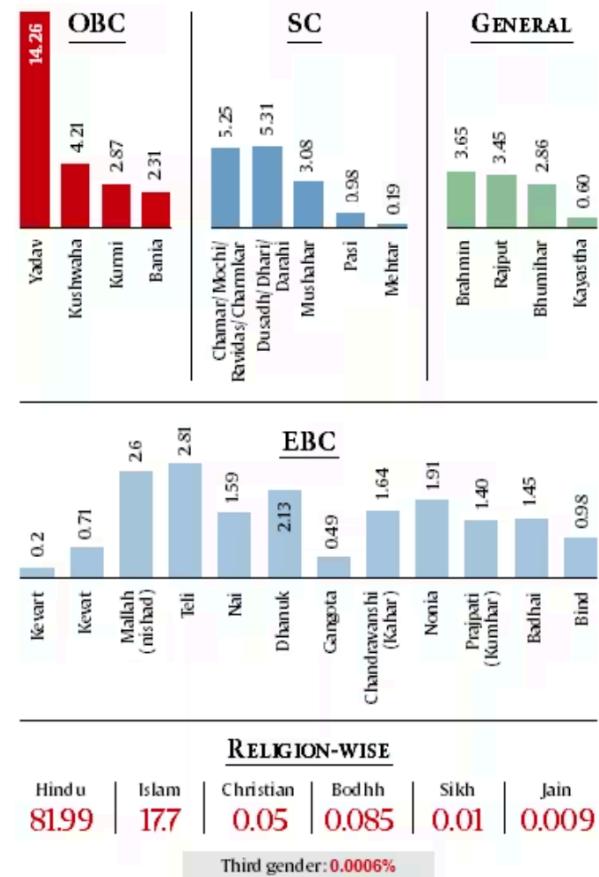
- **Need of a caste census/ Advantages of Caste Census:**

- » **Sociologist Satish Deshpande** says that the realities of caste inequalities in the present must be acknowledged and addressed before we can arrive at a cast-free future. To censor caste division is not to overcome them.
 - **Caste must be counted because it counts** - it is arguably the most important regulatory of life chances today. This means that the caste differences are real differences. To call for "unity" without addressing these differences is to practice dishonest politics.
- » A caste-based census can help in recognizing and quantifying the extent of historical injustices and disparities that exist in society. Recognizing these disparities is a critical step towards addressing them.
- » **Granular socio-economic profile of each caste** should help settle intractable question: Has caste ceased to be a key vector in inequality? Should reservation be based only on caste or on economic status or both? Have a few castes captured the quota? Should there be sub-quotas within the quotas? What should be the cutoff for creamy layer?
- » **Better Targeting of Social Justice initiatives:** It may enhance the demand for quota within quota to ensure benefits reach to extremely backward classes (and not only the dominant OBC

TELLING NUMBERS

How major groups stack up in Bihar

(figures in %)



Third gender: 0.0006%

groups). It will also force political parties to announce and initiate more welfare schemes for the poor and marginalized sections of society.

- » **Caste census will not just be headcount**, it will be a storehouse of **multi-dimensional and multi-layered information** which will be very useful for policy makers and designer of social welfare schemes.
- » **Regular caste-based census data can help track the progress of different caste group over time**, helping better evaluation of policies for social justice.
- » **Constitutional Mandate:** Article 340 of the Constitution of India provides for the appointment of a commission to investigate the conditions for the improvement of socially and educationally backward classes.

- **Limitations/Criticism of Caste Census:**

- » **Deepening of Faultline and Increasing Polarization** - It will lead to delay or prevent the movement towards casteless society.
 - **Criticism of this argument by Yogendra Yadav:** Everyone in a village or Basti knows everyone's caste and that every politician walks with an unofficial caste count of each polling booth.

- **Way forward:**

- » **Preventing the deepening of faultlines:**
 - Articulate the demand for caste census as an element in a larger multi-dimensional ideology of social justice that includes gender, class and location.
 - **Develop a cross party consensus**
 - **Concede it quietly**, rather than create a national row about it. Anyways, the limited side effects cannot outweigh all the benefits outlined above.

- **Conclusion1:**

- » **Caste must be counted in order to strengthen efforts to transcend it.** In a changing India, in which education and technology are important equalizing forces, caste-based affirmative action, fine-tuned with the help of caste numbers, can spur larger conversations on aspiration and ambition, freedom and opportunity, and the need for an eco-system in which citizens are neither unfairly privileged nor straitjacketed by their identities.

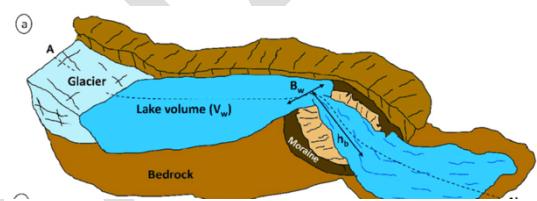
- **Conclusion2:**

- » 'The counting of caste is not a magical wand that will wave away the evils of caste inequality and oppression. Instead, it is a messy, contentious, complex exercise that is sure to have its flaws and inadequacies. But it is also inescapable first step towards an honest political engagement with the real differences and disparities of caste. And for that reason, it is imperative that India no longer evade this.' : **SATISH DESHPANDEY**

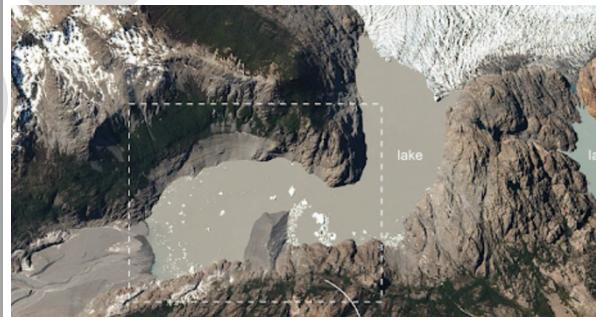
1) DISASTER MANAGEMENT: GLACIAL LAKE OUTBURST FLOOD (GLOF)

- Example Questions
 - » Discuss the key factors which is making Himalayan region more vulnerable to Glacial Lake Outburst floods (GLOF). In light of the recent NDMA guidelines, suggest measures to reduce risks of GLOF disasters (15 marks, 250 words)
- Introduction
 - » GLOFs are sudden fast flowing release of glacial lake water that move downslopes as a result of dam failure. They are recognized in the National Disaster Management Plan (NDMP) 2019 of India as a **potential climatological disaster**.
- Glacial lakes are either moraine dammed or ice margin dammed.

Moraine Dam Glacial Lakes are formed due to the retreating of glaciers, which leave behind soil and rocks and lead to an increase in capacity of lake, making it prone to bursting.



ICE Dam Lakes are created when ice from upper parts of glaciers fall and block passing rivers, giving rise to glacial lakes.



- Different types of lakes may have different hazard potential:
 - For e.g. Moraine-dammed lakes have high probability of breach and hazard potential, whereas the rock dammed lake have little chance of breach and low hazard potential.
- Current Situation:
 - A study, 'Glacial lake outburst floods threaten million globally' published in the journal **Nature** in Feb 2023 highlights that:
 - Around 15 million people globally face the risk of GLOF.
 - Around 20% of them (3 million) live in India.
 - India, Pakistan, Peru and China have more than 50% of the vulnerable people.
- Causes of increasing GLOF
 - Global Warming -> Climate Change
 - Increasing number of Glacial Lakes due to acceleration of glacier melt in recent decades.
 - Increased water pressure due to more water being available due to Global Warming.
 - Ice or rock avalanches, Erosions or other natural disruptions

- **Earthquakes** - Himalayan region is especially prone to earthquakes
- **Human Activities** -> increased tourism, expansion of roads and hydropower projects, deforestation etc have also increased the vulnerability of burst in these lakes.

- **Recent Examples:**

- » **Flash Floods in Sikkim in Oct 2023** which killed 90+ people, destroyed infrastructure like bridges and roads, and damaged state's largest hydropower project, the **1.2 GW Teesta-III**.

- The flash floods were caused by access rainfall and **Glacial Lake Outburst Floods (GLOF)**.
- **South Lhonak lake**, the site of GLOF in Sikkim, was already recognized as potentially hazardous and scientists at the National Remote Sensing Centre had warned of a 42% chance of GLOF in as early as 2013.
- **How it happened in Oct 2023:**



- The GLOF overflowed into **Teesta river**, creating flash floods that destroyed the **Chungthang dam** which is the key component of the state's largest hydro-electric project, and washed away highways, villages and towns. The worst affected districts are Mangan, Gangtok, Pakyong and Namchi.
 - The economic loss will be thousands of crores. Chungthang dam itself cost about Rs 14,000 crores.
- **Note:** Scientists have said that **Sikkim's Glacial Lake is still at risk of GLOF, floods** as there is a slight reduction in the ice area but almost half of the glacier hasn't deglaciated yet. Thus, the lake will further increase in size due to glacier melting and inflow from the North Lhonak glacier.
 - Therefore, it should be monitored to prevent another GLOF.

- » The **Chamoli Flash floods of 2021** may have caused economic damages worth Rs 4,000 crore. It swept away the Rishiganga Hydel Power Project and inflicted substantial damage on the Tapovan Power Project.
- » **2013 Kedarnath** flash floods was also result of GLOF.

- **Adverse Impact**

- » These floods pose **severe geomorphological hazards and risks**
 - It can wreck havoc on all man made structures located along the path and thus endanger people, infrastructure, fields and livestock.
- » **Long term Climate Impact** may be caused by large glacial lake as they would increase the amount of water in ocean and reduce it in Himalayas.

- **Steps taken so far:**

- » **CWC** has done some work towards identification of such lakes;
 - Some other aspects are still work in progress including a robust early warning system, and a broad framework for infrastructure development, construction and excavation in vulnerable zones.
- » **Geological Survey of India (GSI)** carries out assessment of the GLOF threats and provide input to the National Disaster Management Authority (NDMA) for developing risk mitigation strategies.
- » **National Disaster Management Authority (NDMA)** have prepared Guidelines on the Management of Glacial Lake Outburst Floods (GLOFs) which are aimed at improving the administrative responses, drawing on international best practices; and bringing together the relevant scientific capabilities of the nation to eliminate potential losses from glacial hazards.

- **Key Highlight of the NDMA Guidelines**

i. **Inventorization: Hazard and Risk Mapping**

- » Regular monitoring of glacial lakes using satellite observations.
- » Cooperation with neighbouring countries (Nepal, Bhutan and China) to identify transboundary threats and manage it properly.

ii. **Reduction of Hazards**

- **Short term actions** - lowering the lake level through siphoning
 - For instance, high density PVC pipes were installed in **South Lhonak lake in Sikkim**, to reduce the pressure on the lake
- **Long Term Actions**
 - **Artificial drainage channels** to lower lake levels
 - Reinforcement of dam
 - Enhancement of river cross section/ protection from erosion
- **Restricting constructions and development** in GLOF prone areas is a very efficient means to reduce risks at no cost.
- **Develop regulation for Land Use Planning** in GLOF areas.

iii. **Reduction of Exposure**

- Establishment of Early Warning System.
- **Comprehensive alarm system** - including classical alarming infrastructure as well as modern technology using smart phone notifications etc.
- Evacuation based on EWS
- Involve local population closely from the beginning in the design, planning and implementation of risk reduction and management strategies in a transparent collaboration mechanism.

iv. **Awareness and Preparedness** through posters, social media, apps etc.

v. **Capacity Development** -

- Apart from specialized forces such as NDRF, ITBP, and the ARMY, the guidelines emphasize on need for trained local manpower.
- Training of professionals and practitioners;
- Strengthening Academic Education in relevant disciplines from natural and social sciences.
- **Heavy earthmoving and search and rescue equipment**, as well as motor launches, country boats, inflatable rubber boats, life jackets etc.
- Setting up **Quick Reaction Medical Teams, mobile field hospitals, Accident Relief Medical Vans, and heli-ambulances** in areas inaccessible by roads.

vi. **Promote R&D in GLOF Management**

- Promote development of **Modelling tools** to simulate the entire chain of mass movement and outburst process
- **Historical records** should be effectively used to understand flood processes.
- Expand the use of local knowledge, experience of local people. Engaging the local population in **joint-knowledge production** is considered indispensable for effective community based disaster risk management.

vii. **Regulation and Enforcement**

- A well drafted techno-legal regime is necessary to prevent future development of GLOF and protect existing Glaciers.
- The regime should include a Himalaya GLOF mitigation Policy, no habitation and construction zones; and provisions for strict implementation.

- **Other steps which needs to be taken:**

- » **Institutional Improvement:** Need of a **nodal agency** to coordinate all the researches related to glaciers in the region .
- » **Sustainable Development**
 - Restricting Tourism in these areas or promoting only sustainable tourism
 - **Detailed Project Reports and Environmental and Social Impact Assessment** needs to take into account the **Glaciology study** to better understand the impact of these projects on glaciers and glacial lakes.

- **Urgently re-evaluate the Environmental Impact Assessment (EIA) and Environment Clearance Procedure (EAC)** as the existing EIA/EC framework has repeatedly shown inadequacies in handling the high risk projects.
- » **International Cooperation:** GLOF risk is transboundary in nature, thus there is an urgent need for a comprehensive regional risk governance framework including India, Nepal, Bhutan etc.
- » **Fighting Climate Change:** Eventually, a major core reason for GLOF is CC and rising sizes of the lakes. This in long term can only be solved if the global community can work together to achieve Paris Climate Change Targets.

2) ECONOMY: AGRICULTURE – MILLETS

- **Why in news?**
 - » Shifting to millets increases groundwater recharge more than drip irrigation in India's northern plains: Study (Oct 2023: Source - DTE)
- **Question:**
 - » Discuss the potential of millets in climate resilient agriculture and the conservation of agro-biodiversity [10 marks, 150 words]
 - » How has the emphasis on certain crops brought about changes in cropping patterns in recent past? Elaborate the emphasis on millets production and consumption. [Mains 2018, 15 marks, 250 words]
- **Introduction (Current Affairs/Context Based)**
 - » **International Year of Millet (IYM):** The United Nations General Assembly has declared the year 2023 'International Year of Millets'. It will help in creating awareness throughout the world about the significant role of millets in sustainable agriculture and its benefits as a smart food and superfood.
 - » IYM 2023 aims to contribute to the UN 2030 Agenda for Sustainable Development, particularly SDG 2 (Zero Hunger), SDG 3 (Good health and well-being), SDG 8 (Decent work and economic growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate action) and SDG 15 (Life on Land)



- Definitions:

- » Millets include Jowar, Bajra, Ragi, little millets including Kutki, Kodo, Sawa, Kangni and Cheena.

- Cropping:

- » They are generally cultivated in low-fertile land, mountains, tribal and rain-fed areas.
 - These areas include Andhra, Chhattisgarh, Gujarat, Haryana, MP, Rajasthan, MHA, KAR, UP, TN and Telangana.
- » India is the **largest producer and second largest exporter of millet** and in 2022 India produced around 50.9 million tonnes. This accounts for 80% of Asia's and 20% of global production. India is followed by African countries like Nigeria and Niger in production.

- Decreased Production over the years:

- » In pre green revolution era (1965-66), millets were cultivated in 36.90 million hectares of the country. In 2016-17, the area reduced to 14.72 million hectares.

▪ Why?

- **Green Revolution** increased the productivity of wheat and rice.
- Expansion in irrigation.
- MSP Policy
- **Changes in consumption pattern, dietary habits etc**: Socio-economic dynamics resulting from the hardy nature of the crop, relegated them to be the grain of the poor.

- But recent studies have highlighted various significance of millets for healthy life and sustainable economic development:
 - » **Agri-Sustainability:**
 - **Climate Resilience:** Millets are tolerant to droughts, intensive to excess sunlight etc.
 - **Water Efficient:** Millets can survive in less water conditions and can solve the problem of over-extraction of water resources.
 - A new study published in the journal ***Nature Water*** in Oct 2023 highlights that shifting to millets increases groundwater recharge more than drip irrigation in India's northern plains.
 - » **Better Health:**
 - **Food Security:** In arid areas, millets are often the only crops that can be harvested in the dry regions and are a crucial part of household food basket.
 - **Nutrition:** Millets are smart food which are rich in nutrients like protein, vitamin-A, iron, calcium, iodine etc.
 - For e.g., just 100 gm of daily cereals (rice) intake with finger millets (ragi) will increase the daily iron intake by 50% and calcium by 350%.
- **Government Initiatives to promote Nutri-Cereals:**
 - » **Union Budget for FY24** announced an initiative focused on 'Making India a Global Hub for Millets' (Shree Anna).
 - The Indian Institute of Millet Research, Hyderabad, will be supported as the Centre of Excellence for sharing the best practices, research and technologies at the international level.
 - » **MAHARISHI Initiative** i.e., Millets and OtHer Ancient Grains International ReSeArch initiative. This international initiative will focus on research and awareness via agro-biodiversity, food security and nutrition aligning with the International Year of Millets.
 - » **India had declared year 2018 as the Year of Millets:**
 - Spreading awareness about nutritional benefits of nutrients which will help in increasing the demand resulting in remunerative prices for poor and marginal farmers.
 - » Under the **Sub Mission on National Food Security Mission (NFSM) - Nutri Cereals** is creating awareness among farmers for Nutri Cereals (Millets).
 - NFSM - Coarse Cereals are divided into two components.
 - NFSM (Makka and Jau)
 - Sub Mission on Nutri-Cereals covering Jowar, Bajra, Ragi and little millets like Kutki, Kodo, Sawa, Kangni and Cheena
- Although significant strides have been made by many stakeholders in the promotion of millets there are still several aspects that need to be strengthened from both the demand as well as supply side.
 - » **Increasing Demand:**
 - i. **Consumer Awareness:** To increase demand and make them a regular food option, mission mode campaigning is required which not only encourages people to move towards millets but also counters myths and misconceptions as well as demystifies their cooking.
 - ii. **Promote startups** supporting innovative and functional products with millets.

- iii. **Glutten Free** value added products made from millet can be developed for the export market.
- » **Supply Side:** Production as well as Processing needs to be supported and encouraged in different states.
 - i. **Revise traditional methods** of cultivation.
 - For e.g. Systems like Barahnaja (twelve seeds) from Uttarakhand and other mixed cropping practices in different states not only contributed to food security and soil fertility but also to diet and nutrition diversity by including millets, legumes and other nutritious crops in diet.
 - ii. **Provide increased support to farmers** - Increased procurement under MSP
 - iii. **Increased market linkage** can encourage farmers to grow millets.
 - iv. **Increased R&D** for development of High Yielding Varieties.
- **Other Practice Questions:**
 - Critically assess the current status and future prospects of millet cultivation and consumption in India. Discuss the necessary policy interventions and strategies to promote millets as a viable and sustainable food crop.

3. PRELIMS FACTS

1) BIODIVERSITY: DRAGONFLIES

Dragonflies belong to the order Odonata, characterized by large multifaceted eyes, two pairs of strong transparent wings and an elongated body.

They are mostly found in Wetlands – in areas like lakes, ponds, streams – because their **larva called nymphs** are aquatic.

They spend a larger part of their life under water and as an aquatic predator feed on fish, tadpoles, and other aquatic insects.

They were among the very first winged insects to have evolved over 300 million years ago.

Grasshoppers also act as **bio-indicators** and studying their life-cycle gives us an idea about our wetlands and ecology as a whole.

They also act as important bio-control agent as adult Odantes feed on mosquitoes, blackflies and other blood sucking flies. They eat a large number of mosquitoes in their larval stage.



A) NATIONAL DRAGONFLY FESTIVAL

The National Dragonfly Festival, being conducted across 11 states in India by the WWF-India in collaboration with several other organizations like BNHS, aims to create awareness for the conservation of these insects. This festival was first observed in 2018. It is citizen science movement that has been running for the past five years. This festival will continue till December (Oct 2023)

B) RECENTLY DISCOVERED SPECIES

Red rumped hawklet (*Epithemis wayanadensis*): It is a new species of dragonfly that was discovered by naturalist Davind Raju at Wayanad in Kerala. A paper related to this was published in 2023.



2) S&T: DEFENCE: ASTRA MISSILE

- More about ASTRA
 - » It is India's first indigenously developed active radar homing beyond-visual-range air-to-air missile (BVRAAM) with a range of over 100 km.
 - » It is designed and developed by the Defence Research and Development Laboratory (DRDL), Research Centre Imarat (RCI) and other DRDO laboratories.
 - » It is intended to engage and destroy aerial targets with high maneuverability and supersonic speeds. The missile's advanced air combat capabilities allow it to engage multiple high-performance targets.
- Fighter planes which are planned to carry this missile.
 - » Su-30 MKI, Mirage 2000 multi-role combat fighters, and Mig-29 and MiG-21 Bison fighter jet platforms, as well as Indian Navy's Sea Harrier jet fighter.
 - » In Aug 2023, it was successfully test-fired from the LCA Tejas off the coast of Goa during which the missile was released from the aircraft at an altitude of about 20,000 feet.
- IAF is expected to induct ASTRA missile by end-2023 (Oct 2023)
 - » In May 2022, the Defence Ministry signed a contract with BDL for the supply of ASTRA Mk-1 missiles and associated equipment for the IAF and the NAVY at a cost of Rs 2,971 crores.
 - » Bharat Dynamics Limited (BDL) has already received Bulk Production Clearance from the manufacturers of the Astra-Mk1 missiles from the Centre for Military Airworthiness and Certification (CEMILAC) and IAF will complete proof firing and induction this financial year.
 - » The IAF plans to arm its frontline fighters with the Astra-MK1 and officials have said that the Astra-2 would become the mainstay of the IAF's BVR missile arsenal, reducing import dependency.
- Key Advanced Features
 - » Smokeless propulsion system of ASTRA lets it kill its target without giving any clue about the location of launching aircraft.
 - » It is very versatile as it is an all aspect, all weather weapon. This enables the missile to be launched irrespective of relative position of the target with respect to the missile.
 - » ASTRA has highly effective multi-target scenario.
- Significance
 - » Reaffirmation of R&D competence of our defence scientists. Only a handful of other countries, US, Russia, Europe and China have mastered the technologies that go into air-to-air missiles.
 - » Strengthens aircrafts and from the most potent weapon systems for such aircraft in modern aerial warfare and are needed in large numbers by any Air force.
- Understanding some key terms:
 - i. **Active Radar homing (ARH)** is a missile guidance method in which missile contains a radar transceiver (in contrast to semi-active radar homing, which uses only a receiver) and the electronics necessary for it to find and track its target autonomously.
 - ii. **Beyond Visible Range (BVR)** is an air-to-air missile that is capable of engaging in ranges of 20 nmi (37 kms) or beyond.

3) OPERATIONAL AJAY

- It is a major operation to evacuate Indian citizens who wish to return from conflict-hit Israel.
- As of 14th Oct 2023, four flights have come from Israel bringing back a total of more than 900+ Indian citizens.
- **Note:** there are about 18000 Indian nationals living and working in Israel, including caregivers, students, several IT professionals, and diamond traders.



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1. GENERAL STUDIES-2

1) IR: MALDIVES

A) SOME FACTS USEFUL FOR PRELIMS (MALDIVES GEOGRAPHY)

- Officially the Republic of Maldives, is a sovereign island country and archipelago in Indian Ocean. It is located southwest of India and Sri Lanka in the Laccadive Sea.
- The capital and largest city is **Male**, traditionally called the "King's Island".
- It is the **Smallest Asian country** both in terms of land area and population (around 4,00,000). It has recently transitioned from Least Developed Country to Middle income group.
- The island is located atop the Chagos-Maldives-Laccadive Ridge, a vast submarine mountain range in the Indian Ocean.
- It is planet's lowest country, with an average height 1.5 meters above sea level. Also, the country has the lowest natural high point in the world, at 2.4 meters.
- **8-degree channel** separates India (Lakshadweep) and Maldives.
- **Note:** Maldives is located both in the northern hemisphere and southern hemisphere i.e., Equator passes through it.
- **Independence:** In 1965 from British Empire.
- **Multilateral Body Membership**
 - » **SAARC** founding member.
 - » Commonwealth of Nations (left in 2016)
 - » The Organization of Islamic Cooperation



B) POLITICAL DEVELOPMENTS IN MALDIVES

- **Key Political Parties and leadership**
 - » **Progressive Party of Maldives** - PPM - main leaders include Abdulla Yameen, Mohammed Muizzu etc.
 - » **Maldivian Democratic Party** - MDP - Mohammed Nasheed's (now formed a new Party the Democrats) and Mohammed Solih's.
- **Background**
 - » **Maumoon Abdul Gayoom** (half-brother of Abdulla Yameen Gayoom of Progressive Party of Maldives) ruled as an autocratic President from 1978 to 2008.
 - » In 2008, Maldives became a multiparty democracy and **Mohammed Nasheed** (Of Maldivian Democratic Party), became the first directly elected President.

- **2011-12 Crisis**
 - Mohammed Nasheed (the first democratically elected President), under a brief multiparty democratic system, was President till 2012 when he was controversially ousted.
 - Nasheed, later, lost the presidential election in 2013 paving way for **Abdulla Yameen Gayoom** to become President.
 - **Anti-democratic measures under Abdullah Yameen:**
 - Maldives lost much of the democratic gain; stifling of dissent, imprisonment of opposition, control over institutions like judiciary and police were some common affairs.
 - In 2015, Mohammed Nasheed was jailed for 13 years after being found guilty of terrorism charges.
 - **Maldives** even announced its leaving of Commonwealth in 2016. This was because the commonwealth had earlier warned Maldives that it risked suspension if it didn't show progress on democracy.
 - **Abdullah Yameen** has been the most-Pro China president so far.
 - Yameen gave opportunities to China to increase its influence in Maldives.
 - One primary reason for it was that Yameen perceived that Nasheed was helped a lot by India.
 - **Feb 2018 Crisis: the 45 days emergency**
 - President Yameen declared emergency and ordered arrest of 2 senior judges who had ordered release and re-instate of 12 lawmakers who were arrested in politically motivated cases.
 - This move was criticized globally as another attempt to suppress any kind of dissent and killing democratic institutions.

SEP 2018 DEMOCRATIC TRANSITION: DEFEAT OF YAMEEN AND IBRAHIM MOHAMMED SOLIH BECAME THE PRESIDENT

- **Ibrahim Mohammed Solih** was a joint candidate of Maldivian Democratic Party, The Jumhooree Party and the Adhaalath Party.
- **Impact:**
 - » A moment of joy for democracy lovers
 - Political prisoners were released.
 - » Solih made rebuilding strong relations with India a priority.
 - Both countries have tried to align their respective policies of SAGAR (Security and Growth for All in the Region), India's "Neighborhood First" approach and Maldives' "India First" approach.
 - During PM Modi's 2019 Maldives visit, Solih reiterated his government's "India First" approach and "pledged his government's full support towards deepening the multifaceted, mutually beneficial partnership between India and Maldives,

which has traditionally been characterized by trust, transparency, mutual understanding and sensitivity.

- India has also been involved in **Infrastructure and Connectivity Project** including the Greater Male Connectivity Project (GMCP)
- India also provided assistance during COVID-19 crisis and helped Maldives during the campaign to move Maldives foreign minister Abdullah Shahid elected President of UNGA.

2023 ELECTIONS:

- **Mohamed Muizzu** was elected President of Maldives as he defeated the incumbent, Ibrahim Mohamed Solih. (Oct 2023)
 - » He was the joint candidate of the **opposition coalition** (People's National Congress - **Progressive Party of Maldives**).
 - » **What were the key reasons for defeat of Ibrahim Mohammed Solih:**
 - Heavy anti-incumbency sentiment
 - Concerns over the post-Covid-19 economy that is dependent on tourism.
 - **The rift within Solih's Party**, the MDP, due to a rupture in his old friendship with former President Mohammed Nasheed.
 - With Mr Nasheed, a communicator par excellence gone, the MDP could not effectively counter the disinformation campaign launched by the opposition alliance, which inserted, unnecessarily, the issue of geopolitics in a domestic campaign.
 - **Concerns over Sovereignty** issues, whipped up by Mr. Muizzu's PPM that is behind an "**India Out**" campaign to oust Indian military personnel.
 - **Impact:**
 - » The latest Presidential election in Maldives showed that **democracy is thriving**. The holding of yet another free and fair election enhance the country's international Prestige.
 - » **People's National Congress and Progressive Party of Maldives** are known for their pro-China stance.
 - For e.g., after his election, Muizzu has said that he will stick to his campaign promise to remove Indian military personnel stationed in archipelago state.
 - Therefore, it is assumed that Maldives will soon have a pro-China shift in its foreign policy.
 - » At the request of President-elect Muizzu, President Solih agreed to shift former President Yameen from Prison to house arrest. Mr. Yameen is serving long sentence for corruption. He is seen as Mr. Muizzu's mentor.
 - **Key challenges ahead for Mohamed Muizzu:**
 - » How to balance between India and China

- » Dealing with challenges of mounting debt, dwindling foreign reserves, and heightening climate risks.

C) CHINA'S INCREASING INFLUENCE IN MALDIVES AND INDIA'S CONCERNs

- Maldives was not always a priority for China's Foreign Policy; Till 2011, Beijing didn't even have an embassy in Male.
- However, since Sep 2014, Xi Jingping's visit, Maldives had increasingly moved into Chinese Orbit especially under Abdulla Yameen's presidency (2013-18)
- **Why is China Vying for expanding its influence in Maldives?**
 1. **Maldives' strategic location** in the Indian Ocean
 - Maldives is located between India and Diego Garcia - making it a preferred destination for operating a military base and maritime surveillance.
 2. **Presence of several International Sea lines of communications (SLOCs)** is an additional imperative.
- **During President Abdullah Yameen Gayoom Yameen's Presidency (2013 - 2018), the increasing influence of China was manifested** in the following steps:
 1. **Maldives entering into an FTA with China:** This was the first FTA of Maldives with any country.
 2. Maldives also signed an MoU to join Maritime Silk Road (a component of China's ambitious BRI).
 3. Maldives under Yameen had also eagerly embraced Chinese Investment and loans for infrastructure development.
 4. A **constitutional amendment** allowing foreign ownership of freehold land was passed in 2015. This is allowed provided minimum investment is \$1 billion and 70% of the land is reclaimed region. This also gave China the opportunity to enhance its military presence on the island nation. China's Naval ships frequently visited Male.
- **This had made India worried:**
 - » **Increased Chinese presence** in India's neighborhood had negative implications for India's security.
 - » **India** is also apprehensive of Maldives falling in China's debt trap as it will make Maldives vulnerable to China's demands and pressures. This could already be seen in the form of 2015 Constitutional Amendment and increased Chinese Naval Presence in Maldives.
- **After election of Muizzu as President in 2023**, these worries have re-emerged for India.

D) INDIA-MALDIVES RELATIONS

- **Background**
 - » Relations between India and Maldives go back several centuries. This relation further grew in decades following Maldives independence from Britain in 1965 and strengthened in 1980s and 1990s with India readily available to help Maldives on all fronts.
 - » India has played a critical role in building Maldives' economy and ensuring political stability then. Delhi supported authoritarian rule of Abdul Gayoom and enabled him to remain in power

for three decades. Delhi also helped Maldives to avert a coup attempt to oust Gayoom in 1988 and protect its territorial integrity (**Operation Cactus, 1988**).

- » India's relations with Maldives continued to grow even under the first democratically elected President **Mohammed Nasheed**.
- » In 2014, when there was a drinking water shortage in Maldives due to dysfunction of the only desalination plant there, Indian Navy had rushed the drinking water to Male.
- » Both the countries share strong geographical, cultural and religious bonds.
- » Maldives has also been an important component in India's Maritime strategy.

- **But during Yameen's Presidency (2013-2018) ties between Delhi and Male had nosedived.**

- » The political situation forced PM Modi to cancel his 2015 visit to Male.
- » Maldives annulled the \$500 million contract of GMR Group to develop a modern international airport near Male and gave it to a Chinese company.
- » Relations reached at its lowest point after the Feb 2018 Emergency imposition by Yameen government to curb all kinds of dissent including from judiciary.
- » India's influence reduced in Maldives:
 - **Changing Political dynamics of Maldives**
 - India was perceived as close to Mohammed Nasheed and thus **Abdul Yameen moved away from India**.
 - **Increasing Chinese Influence in the region**
 - Debts, Infra Projects, FTA etc.
 - **Reducing dependence on India:** With its booming tourism sectors, Maldives now is less and less dependent on assistants from India.
 - **Increasing role of Pak and Saudi Arabia and growing radicalisation**
 - Maldives is a moderate Islamic Country. In recent years, Saudi Arabia has opened many Madarsas to spread Wahabism.
 - Scholarships are being provided for studying in Pak.
 - Religious fundamentalism played an important role in ouster of Nasheed who had a secular ideology and had allowed Israeli tourists to visit Maldives and establishment of Buddha's statue in Male.

- **But things started changing in 2018 when Solih came to power: India's influence increased:**

- » Already discussed in the impact section of Political development.

- **Why Maldives is Significant for India**

i. **Strategic Location**

- It is located around 700 km from India's Lakshadweep island chain and around 12,00 km from the Indian mainland.
- Its proximity to international sea lane through which 2/3rd of the World's oil and half of its container shipment pass also makes Maldives very important for Geo-political reasons.

ii. **Countering China's String of Pearls strategy**

- Increased Chinese presence in Maldives will negatively impact India's strategic interest. To counter China's String of Pearl strategy we have to have good relations in Maldives.

iii. **Securing Sea Lanes**

- Maldives can play a significant role in dealing with Piracy and building stability in the Indian Ocean region.

iv. Protecting Interest of Indian Diaspora

- More than 20,000 Indians live in Maldives. They form the second largest expatriate community there.

v. Preventing further radicalization of youth in Maldives.

vi. Enhancing the traditional strong relations

- Way Forward: Change in Political Situation in Maldives:

» **India must engage with new government in Maldives** and deepen ties. India's cooperation with Maldives is based on jointly addressing shared challenges and priorities. The assistance and platforms that India's has provided have contributed to areas like people's welfare, humanitarian assistance, disaster relief, and combating illegal maritime activities like Piracy, smuggling etc.

- Other Steps that can be taken are:

▪ **Strengthen Colombo Security Conclave:**

- Colombo Security Conclave comprise of India, Sri Lanka, Maldives, Mauritius, Bangladesh and Seychelles. It should be strengthened showing tangible outcomes in maritime security and the development of the Blue Economy.

▪ **Invite Maldives as observer in BIMSTEC Grouping:**

- This will be a bold-reimagination of post SAARC south Asia.

▪ **Perennial need of additional Resources** to be invested in Maldives.

- This will provide India's strategic community and media organizations take more interest in the small but vital neighbor, building bridges of mutual understanding and trust.

» New Delhi must **avoid the impression that it has favorites within the Maldivian Polity**. It should be perceived as working for the people of Maldives. This will ensure that no matter which party comes to power in future, India's influence in Maldives wouldn't wane.

» **India is significant for Maldives and the entire political spectrum (including Progressive Alliance) understand this.**

- **Despite political posturing by the Progressive Alliance** - there is an hard realization in the Maldives that India is the biggest security partner in the region and makes up for Male's scarce maritime capacity and capabilities.

- It is no coincidence that even Yameen continued defence cooperation with India during the roughest phase of bilateral relations.

- India is also Maldives' biggest trade partner, a top export destination and a traditional donor.

» **World has changed since Mr. Yameen's time and China and Pakistan may not be able to have so much influence now.**

- The BRI which Maldives had accepted, is in serious trouble.

- **Sri Lankan Financial Crisis** showed the impact of China's debt trap and how India's steady help to Sri Lanka was beneficial.
 - **Islamist constituency in Maldives** which is not very friendly with India will also notice the changed equation between India and the gulf states. It is reflected in the waning influence of West Asia in a bankrupt Pakistan, which has long nurtured extremism in Maldives.
- » But India still needs to keep an eye on China's expanding influence in Maldives especially after Muizzu coming to power.
- **Conclusion1:**
 - » One is likely to see a continuation of the China-India political competition in Maldives, as it has been in the rest of the Indian neighborhood. The election of Muizzu as President may give China some advantage, but Male surely recognizes that it is also not in Maldives' interest to put all its eggs in Beijing's basket.
 - **Conclusion2:**
 - » India too is likely to show pragmatism and flexibility with the administration as long as the incoming Maldivian government respects India's sensitivities and security concern.

2. GENERAL STUDIES-3

1) ECONOMY: FOOD SECURITY

A) FOOD SECURITY

- **Why in news?**
 - » World Food Day is celebrated on Oct 16 each year. (Oct 2023)
 - The FAO of UN created this in 1979. It was established to raise awareness of world hunger and encourage action to combat it and recalls the **FAO's foundation in 1945**.
 - The theme for 2023 is "**Safe Food Today for a Healthy Tomorrow.**"
- **Practice Questions:**
 - » "There is an urgent need for sustainable and resilient food systems to guarantee sustainable diets that are nutritious and aligned with the evolving ecosystem and climate change" Elaborate [15 marks, 250 words]
- **What is Food Security?**
 - » As per the Committee on World Food Security, the food security exists when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life.
 - » The **Four Pillars** of food security are availability, access, utilization, and stability (both price and supply).
- **Situation in India:**
 - » The 'State of Food Security and Nutrition in the World' of the FAO estimates that in 2021 around 74% of the population in India cannot afford a healthy diet. This number may be an overestimation, but still shows that a substantial number of people in India are not able to afford health food.
 - » **Other Reports:**
 - In 2022, Global Food Security Index ranked India at 68/113 major countries of the world.
 - As per Global Hunger Index, 2023, India's rank was 111/125 countries.
- **Key Initiatives to Promote Food Security in India:**
 - » **National Food Security Act, 2013:** It seeks to provide subsidized food grains to approximately 2/3rd of India's population.
 - Other than this, Mid-Day Meal Scheme, Integrated Child Development Program, and the PDS system are focused on ensuring nutritional security.
 - » **Various initiatives at state level include:**
 - '**Indira Canteen**' initiative by the state of Karnataka, which serves breakfast, lunch and dinner at very low prices.
 - '**Amma Unavagam**' (Mother's Canteen) is an initiative by TN.
 - » **Government also takes** several initiatives to control food inflation:
 - **Maintaining Buffer stocks**

- **Controlling Exports** in case of scarcity
- **Using MSP mechanism** to encourage farmers to grow crops which are in shortage.

- **Key factors which threaten Food Security:**

» **Poor Governance and Geo-Strategic Conflicts**

- Inadequate governance structures to ensure institutional stability, transparency, accountability etc. may lead to poor food supply situation.
 - For e.g. - Corruption in PDS system leads to diversion of food grains meant for poor people.
- **Poor state services in rural areas** - For e.g., people in remote areas not being able to get PDS services because of lack of documentation.
- **War, conflict and lack of security** may create food security challenges: E.g., Russia-Ukraine war impacted the supply of food grains and led to higher inflation.

» **Economic and Production Factors:**

- **Poverty, unemployment, inadequate social protection system** etc hampers availability of good and nutritious food.
- **Lack of focus on reforms in agriculture sector** - Less than the actual potential production.
- **Insufficient farm income** of small and marginal farmers
- **High Post harvest losses** - due to inadequate infrastructure for storage and market access.

» **Unsustainable Agriculture Practices:**

- **Increased dependency on wheat and rice** has led to excess irrigation which has led to water table going down and soil salination.
- **Land Fragmentation** is also making agriculture unsustainable which may impact food security in long term.
- **Deteriorating Soil health:**
 - **Access use of chemical inputs** like fertilizers and pesticides is hampering the soil quality.
 - 2023 Soil Health Survey shows that almost half of the cultivable land in India has become deficient in organic carbon, which is an essential indicator of soil health.

» **Climate/ Environmental Challenges:**

- Increased cases of droughts, heatwaves, unpredictable rainfall pattern etc. causing damage to food systems.
 - Increase in number of days with extreme temperatures or rain has caused a decline in quality and size of seeds across India.
- **Biodiversity Loss** for e.g. reduction in population of pollinators also has the potential to impact large majority of food crops.
- **Environmental damage in forests** is reducing the food supply their causing wild animals to attack human's food system (for e.g. the blue bull trouble in India)

» **Demographic and Social Issues:**

- **Insufficient attention** paid to the **role and contribution of women** and their special vulnerabilities in regard to malnutrition, and many other forms of **legal and cultural discrimination** they suffer.
- **Inadequate social protection system**, including safety nets.
- **Marginalization and discrimination against vulnerable groups** such as internally displaced people, refugees etc.
- **Poor availability** of **safe water, sanitation, maternal and child health facilities**.
- **Inappropriate consumption** and **Over consumption of food**, often with a lack of essential macronutrients, can cause serious problems to health, including malnutrition and obesity.
- **Low level of education and literacy** leads to **detrimental feeding/ behavioral practices** etc.

- **Way Forward:**

- » **Good Governance:**
 - Increasing transparency and accountability through effective implementation of initiatives like social audit, RTI and e-governance.
- » **Consumers side reforms:**
 - **Demand** needs to **change towards healthy and sustainable diets**.
 - Corporations can **mainstream locally grown millets** through innovative breakfast products.
 - **Civil Society and health community** can partner with **social media influencers** who can shape healthier and sustainable consumption for millions.
 - **Government** through initiatives like **PDS, mid-day meals, railway catering, urban canteens, and public and institutional procurement**, can help improve what at least 70% of Indians are consuming.
 - **Religious institutions** can also influence food habits.
 - E.g. **Tirumala Tirupati Devasthanam**, which serve **nearly 70,000 people daily**, has started procuring **naturally grown food items**.
- » **Promoting Agricultural Sustainability:**
 - **More R&D on organic farming and natural farming:** The National Mission on natural farming is a step in this direction, but the overall funding for sustainable agriculture is **less than 1% of the agri budget**.
 - **Shift agri-subsidy from input subsidies to cash transfer:** It would promote **efficient use of inputs**, while enabling levelplaying field for agro-ecological practices to thrive.
 - **Consolidation of landholding** for e.g. by **bringing farmers under an FPO, or through contract farming etc.** is crucial to deal with challenges of land fragmentation.
 - **Second Agricultural Revolution** with special focus on east India can be crucial in promoting agri-productivity in India.
- » **Shift farm-to-fork value chains** towards **more sustainable and inclusive ones**.
 - **Enable more value addition of agri-produce** in rural areas
 - **Strengthening FPOs**
- » **Dealing with Climate Change related challenges:**

- **Working on Paris Climate targets**
 - Global community needs to work on Paris Climate targets to ensure mitigation of climate change which is emerging as one of the biggest threats to food security.
 - **Working towards Adaptation in Agriculture sector:**
 - Development of drought and flood resistant variety of crops.
- » **Focus on Demographic and Social Issues**
- **Gender Equality and Women empowerment** is crucial to limit the culture of women eating in the last and prioritizing special food requirement of women specially during pregnancy.
 - **Special focus on vulnerable groups** in rural and remote areas. Prioritize Aadhaar and ONORC initiative for these people so that they are able to enjoy the benefit of all government benefits.
- **Conclusion:**
- » The urgency of addressing the above discussed pressing issues through the transformation of food production and distribution systems that harmonize environmental, social, and economic dimensions is imperative.

B) NATIONAL FOOD SECURITY ACT, 2013

- **Why in news?**
 - NITI Aayog seeks detailed evaluation of the National Food Security Act and LPG Subsidy (Oct 2023)
 - The NITI Aayog has invited bid for a central coordinating agency that can study effectiveness of NFSA and LPG Subsidy Scheme. The agency will hold mandate to suggest ways to better the schemes. It will also suggest whether, and how, these schemes can be rationalized or closed.
- **Past Year Questions:**
 - » What are the salient features of the National Food Security Act, 2013? How has the Food Security Bill helped in eliminating hunger and malnutrition in India [Mains 2021, 15 marks, 250 words]
 - » Food Security Bill is expected to eliminate hunger and malnutrition in India. Critically discuss various apprehension in its effective implementation along with concerns that it has generated at WTO [Mains 2013, 12.5 marks, 200 words]
- **Introduction:**
 - » The NFSA, 2013 seeks to provide for food and nutritional security in human lifecycle approach, by ensuring adequate quantity and quality of food at affordable prices to people to live a life with dignity and for matters connected therewith and incidental thereto.
- **Salient Features of the Act are:**
 - » It gives legal entitlement to 75% rural and 50% of the urban population (which come to 2/3rd of country's population) for subsidized grains under TPDS.

- » It moves from '**household food entitlement**' to '**individual food entitlement**'. Every individual is entitled to 5 kg of rice, wheat, or coarse cereals a month at Rs 3, Rs 2 and Rs 1 per kg. The beneficiary is identified by the state government based on the parameters decided by centre.
- » The entitlement for Antyodaya Anna Yojna (AAY) will remain at Rs 35 kg per household.
- » **For pregnant and lactating mothers**, the act provides for free meal at the local anganwadi (during pregnancy and upto six months after child birth) as well as maternity benefits of Rs 6,000 in instalments.
- » **For Children:**
 - Below 6 months: 'Exclusive breast feeding shall be promoted)
 - **Six months to six years:** The age guarantees an age appropriate meal, free of charge, through the local anganwadis.
 - **Six years to 14 years:** One free mid-day meal, shall be provided everyday (except on school holidays) in all school run by local bodies, government and government aided schools, upto Class VIII.
- » The act also provides for the Creation of State Food Commissions which will monitor and evaluate the implementation of the act, give advice to state governments and will enquire into violations of entitlement.
- » **Food Security Allowance** in case of non-supply of the entitled quantities of foodgrains or meals to entitled persons under the act.
- » **Schedule 3 of the act** also lists various provisions for advancing food security, under three broad categories:
 - Revitalization of Agriculture; reforming procurement, storage and movement; other provisions like drinking water, sanitation, health care, adequate pensions for senior citizens, persons with disability and single women.

- **Progress:**

- » NFSA has been implemented in all 36 states/Uts covering more than 80 crore persons.
- » Direct Benefit Transfer: In Chandigarh, Puducherry, and Urban areas of Dadra and Nagar Haveli, the act is being implemented in the cash transfer mode.

- **How has it contributed to reducing Hunger:**

- » The act has led to increases food availability for weaker section. It is visible in increased government food subsidy burden.
- » By continuing with special provisions AAY, the act ensures that the most vulnerable household get special support.
- » By taking a lifecycle approach, it has ensured the right from the time women get pregnant to the death of a person, if the person is vulnerable, she would get food security support.
- » With improved used of technology, like Aadhar based authentication, leakage has reduced.
- » **One Nation One Ration Card (ONORC)** will also ensure that migrants are able to enjoy the benefits of NFSA.

- **Challenges:**

- » **Fiscal Burden:** Since the introduction of PMGKAY, the subsidy burden on food for government has remained above Rs 2 lakh crores.
- » **Leakages and Siphoning:** Leakages are still unacceptably high in states where PDS reforms are slow.

- **Steps being taken:**
 - Doorstep delivery, computerization, effective grievance redressal mechanism etc.
 - The leakage trend has been declining from 54% in 2004-05 to 44% in 2007-08 to 35% in 2011-12. It is estimated to have gone down further.
 - » **Identification of Beneficiaries:** This is a serious issue as many very vulnerable sections are not enjoying the benefits of NFSA.
 - » **Infrastructural issues** like lack of adequate storage, poor transportation infrastructure. This leads to delay, spoilage of food grains, and inefficient distribution.
 - » **Aadhar Related Issues:** Use of Aadhar-based authentication for targeting beneficiaries has its own set of challenges. This includes authentication failures, discrepancy in Aadhar data etc.
 - » **Social and Cultural Factors:** Factors like caste-based discrimination, low literacy rates etc can impact the implementation of NFSA.
- **Way Forward:**
- » **Reducing Fiscal Burden:** TPDS targeting can be made more focused and only the most vulnerable ones should be provided the NFSA benefits. Shanta Kumar committee had also recommended that the coverage should reduce from 67% of the population to 40%.
 - » **Better Identification:** Instead of trying to identify the poor, it would be better to adopt an 'exclusion approach' under which the rich are kept out and all the rest are covered.
 - Chhattisgarh Food Security Act (CFSA) which proposes four criteria - excluding income tax payees, households owning a pucca house in urban areas that has a carpet area of more than 4 hectares of irrigated land or more than 8 hectares of non-irrigated land.
 - » **Combating Leaks:**
 - Automate procedures; impose strict penalties for corrupt practices etc.
 - » **Improving Infrastructure:**
 - Attract private investment in agri-infrastructure, including storage facilities.
 - Promote decentralized procurement.
 - Encourage local farmers and cooperative.
 - » **Address Aadhar Issues:**
 - Achieve universal Aadhar coverage by a focused approach on most vulnerable groups.
 - For the time being establish alternative authentication mechanism.
 - Ensure robust data security measures to protect personal information.
 - » **Addressing Social and Cultural Factors:** Run a sensitization campaign to raise awareness about the rights and entitlements of marginalized communities.
- **Conclusion:**
- » The NFSA is an important step in meeting the problem of hunger and malnutrition. By implementing the above suggested improvements, and by fostering collaborative efforts among government agencies, Civil Society Organization, and local communities, it is possible to overcome the challenges and strengthen the implementation of NFSA.

2) S&T: CONTRIBUTION OF SCIENTISTS: MS SWAMINATHAN

- **Why in news?**

- » MS Swaminathan, the Doyen of India's Green Revolution passed away on 28th Sep 2023 in his residence in Chennai. He was 98.

- **Brief Timeline:**

- » **Aug 7, 1925:** Mankombu Sambasivan Swaminathan was born to M.K. Sambasivan, a surgeon, and Parvati Thangammal in Kumbakonam in the then Madras Presidency.
- » **1940s Education:** He pursued higher education in zoology from Maharaja's College in Trivandrum. With a keen interest in Agriculture, farming and moved by the plight of farmers, he later completed a BSc degree in Agriculture Science from University of Madras in 1944.
- » **1947-49:** Swaminathan had witnessed the 1943 famine and after that dedicated his life for improving India's farming methods and battling shortage of food. He joined IARI after Independence to focus on plant genetic and breeding.
- » **1949-54:** Swaminathan by now had specialized in genus Solanum of the potato and was offered a fellowship by UNESCO to research ways to combat parasite affecting potato crops - which were then in high demand. He then moved to University of Cambridge and earned his PhD. After this he spent time in the Laboratory of genetics in the University of Wisconsin to set up a US Government potato research station as part of his post doctorate.
- » **1954:** As a scientist at IARI he learned about Dr. Norman Borlaug's newly developed Mexican dwarf wheat variety which could higher yield and develop stronger stalk structures to support the increased biomass.
 - Both scientists worked to produce improved crop varieties in India.
 - He also researched on fertilizers conducive to the Indian Soil for growing wheat, different high yielding wheat varities.
- » **1965-70:** Continuing his research with Dr Borlaug on wheat varities, he modified grains in labs to better suit the Indian Soil, giving higher yield and free from infestation. He then convinced farmers mainly in northern rural belt - Punjab, Haryana and UP to set up small demonstration and test plots to cultivate these wheat varieties. Working with Union Agriculture Ministers C. Subramaniam and Jagjivan Ram, he pioneered Green Revolution. His work ushered India's golden age in farming technology - transforming the nation from a 'begging bowl' to the 'bread basket of the world'.
 - During his tenure at IARI he also contributed to Nuclear Agriculture by setting up Nuclear Research Laboratory and development of mutated varieties.
- » **1979-82:**
 - As the Director General of ICAR, he worked to educate farmers on weather and crop patterns by setting up thousands of ICAR centres across India.
 - In 1979-80, he was appointed as Principle Secretary of the Ministry of Agriculture to establish agriculture policies to maintain India's long term food sufficiency.
 - 1980-82: he was made in charge of agricultural and rural development in India's Planning Commission.

- In 1982, he became Director General of International Rice Research Institute in the Phillipines - the first Asian to hold the post - and worked to promote the participation of women farmers on rice cultivation.
- **1987-2000:**
 - He was awarded the first World Food Prize in 1987. Using the award money he set up MS Swaminathan Research Foundation in 1988 to provide collaborative platforms for global leaders, rural farmers to coordinate research on various issues.
 - **In 2004**, he was made the chairperson of National Commission on Farmers which was constituted to address rising farmer suicide in India.
 - **2013 Onwards:** In this phase he was part of various initiatives which were focused on nutrition, access to internet in rural India etc.
- **International Accolades throughout his life:**
 - The Ramon Magsaysay Award in 1971
 - Albert Einstein World Science Award in 1986
 - UNEP Sasakawa Environment Prize in 1994
 - UNESCO Gandhi Gold Medal in 1999
 - Indira Gandhi Prize for Peace, Disarmament and Development in 1999
- He has also been awarded with Padm Shri in 1967, Padma Bhushan in 1972, and Padma Vibhushan in 1989.

3. PRELIMS FACTS

1) ART & CULTURE: PROJECT UDBHAV BY INDIAN ARMY

- **Details:**
 - » Project Udbhav is an initiative set in motion by Indian Army to rediscover the profound Indic heritage of statecraft and strategic thoughts derived from ancient Indian texts of statecraft, warcraft, diplomacy and grand strategy.
 - » It focuses on broad spectrum including Indigenous Military Systems, Historical texts, Regional Texts and Kingdoms, Thematic studies and intricate Kautilya Studies.
 - » The **goal** is to understand the profound depths of indigenous military systems, their evolution, strategies that have been passed down through the ages, and the strategic thought process that have governed the land for millennia.
 - » The aim is not only rediscovery, but also to develop an indigenous strategic vocabulary, which is deeply rooted in India's multifaceted philosophical and cultural tapestry. Overall aim is to integrate age old wisdom with modern military pedagogy.
 - » The project seeks to bridge the historical and contemporary.
- **Some related work has been going on since 2021**, and a book was released under the project which lists 75 aphorisms selected from ancient texts. However, the first scholarly outcome of the initiative is the 2022 publication titled 'Paramparik Bhartiya Darshan... Ranniti aur Netriyta ke Shashwat Niyam" meant to be read by all ranks of the Indian Army. English translation of the title being "**Traditional Indian Philosophy... Eternal Rules of Warfare and Leadership**".
- **In Sep 2023**, an inaugural panel discussion was conducted under the Project Udbhav. The scope of the discussion encompassed discussions on the study of ancient texts from the 4th century BCE to the 8th century CE, with the focus on Kautilya, Kamandaka, and the Kural. It sparked interest, engagement and further research into India's traditional strategic thought.

A) KAUTILYA'S ARTHASHASTRA

- **Arthashastra** is a treatise on statecraft. It is a branch of learning that deals with the means of acquisition and protection of earth, which is the source of people's livelihood. Thus, Arthashastra is a science of statecraft.
 - » It consists of **15 books** (Adhikarans) - the **first five** deal with internal administration (tantra), the next eight with inter-state relations (avapa), and the last two with miscellaneous topics.

B) KAMANDAKA'S NITISARA

- **Nitisara** (Essence of Statesmanship) is an Ancient Indian Treatise on Politics and Statecraft.
 - » It was authored by Kamandaka, who was a disciple of Chanakya.
 - » It is traditionally dated to the 4th-3rd Century BCE, though modern scholarship various dates it between the 3rd and 7th century CE between Gupta and Harsha period.

- » **Structure:** It contains 20 Sargas (Chapters) and 36 Prakarans. It is based on Arthashastra of Kautilya and deals with various social elements such as theories of social order, structure of the state, obligations of the ruler etc.

C) KURAL (OR TIRUKKURAL) BY TIRUVALLUVAR

- It is a classic Tamil language text consisting of 1330 short couplets, or kurals of seven words each. It is considered as one of the greatest works ever written on ethics and morality, and is widely acknowledged for its universal values.
- Tirukkural is divided into **three books**, each with teachings on **Virtue (Dharma)**, **Wealth (Artha)** and **love (Kama)**
- **Date:** The text has been variously dated between 300 BCE to 5th century CE.
- **The issue of statecraft, governance, and related topics** embedded in the Kural are less known, understudied and not theorized for modern times. Therefore, Focus on Project Udbhav on study and revival of political wisdom and statecraft in the Kural will be an important contribution for contemporary times

2) CRICKET'S GETS APPROVAL FOR 2028 LA OLYMPICS

- Cricket, squash, baseball/softball, lacrosse and flag football have been included as part of 2028 LA Olympics.
- With this Cricket will be returning to Olympics after 128 years.
 - » It will be played in 20-20 format and will be a six-team affair. IOC or the ICC is yet to decide on the qualifier format.
- **Lot of Backchannel work was needed.**
 - » Cricket's inclusion was made possible by two years of intense backchannel work between the IOC and ICC with Nita Ambani, an IOC member from India since 2016, playing a key role in building a consensus for the sport among the Olympic community.

3) BIODIVERSITY: NEW FISH SPECIES: BADIS LIMAAKUMI (SOURCE: DTE)

Scientists have recently discovered a new fish species from Milak River, Nagaland. It has been named *Badis limaakumi*, after Limaakun, assistant professor and head of the zoology department at Fazl Ali College, nagaland.

It belongs to family Badidae, a small freshwater fish found in streams with slow or moderate water flow. These are edible fish and are also found in ponds and stagnant water.



The new species differs from other members of the genus due to its larger size and other physical characteristics.

Fish from the Badis family are also known as chameleon fish for their ability to change color. This helps them blend with the surrounding when under stress.

4) BIODIVERSITY: INVASIVE EXOTICS: CANOCARPUS TREES

- **Concerns over the management of invasive Conocarpus species of trees have recently led to Gujarat (2023) and Telangana (2022) banning their use. Several other states may follow suit - which is likely to discourage horticulturalists and nurseries from multiplying the species and using lakhs of its saplings in afforestation and landscaping projects across the country over the next year.**
- **Problem with Exotic Plants:**
 - » Many species which were introduced in India for greening or ornamental purposes eventually turned invasive.
 - » Native species which were not able to compete for resources were driven to extinction and huge cost was incurred in the management of invasive species.
 - Some popular species include Eucalyptus, Proposis Juliflora (Vilayati Kikkar), Acacia mangium, and Lantana Camara.
 - » Further, they are also known for causing pollen allergies. Human immune system coevolve with local pollen calendar and this new type of pollen becomes a problem.
- **About Canocarpus Trees:**
 - » There are two species of Canocarpus (buttonwood) trees, with several varieties of hybrids - Canocarpus erectus, which is widely used in India (and is native to South America) and Canocarpus lacifolius is native to East Africa.
 - » They are easily propagated and multiplied in nurseries through stem cuttings.
 - » They have also been known to cause pollen allergies and respiratory problems in the vicinity of plantation.
- **Why do urban green initiatives end up deploying them in the first place?**
 - » Since they are non-native species - they face very few or no pests or pathogens in new habitats, which makes their proliferation easy. They often require very little aftercare.
 - » Some species like Canocarpus are not browsed by livestock and are thus favored for horticultural and landscaping projects.
- **What should be done?**
 - » Landscape manager should choose from amongst the native species pool, species that are ecologically appropriate and also meet aesthetic needs.

- » The import and use of horticultural plants need to be monitored by maintaining a watch list of plants that are known to harm native species and ecosystems and raise public health concerns.

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1. GENERAL STUDIES-2

1) ISSUE OF CHILD SEXUAL ABUSE:

About Child Sexual Abuse:

- Child sexual abuse is defined as **sexual activity with a child by an adult, adolescent or older child.**
 - ✓ If any adult engages in sexual activity with a child, that is sexual abuse.
 - ✓ If another child or adolescent engages in sexual activity with a child, a grey area enters where some sexual behaviour is innocent exploration rather than abuse.
- The **World Health Organisation** has defined '*child sexual abuse as the involvement of a child in sexual activity as he or she does not fully comprehend, is unable to give informed consent to, or for which the child is not developmentally prepared and cannot give consent, or that violates the laws or social taboos of society*'.

Data/Facts:

- Crimes against children **increased in India by 16.2% between 2020 and 2021**, according to **the latest National Crime Records Bureau (NCRB) data**:
 - ✓ There were just **under 1.5 lakh cases of crimes against children** registered last year across all states and Union Territories. This includes child sexual abuse, abduction, murder, child marriage among other crimes.
 - ✓ **Madhya Pradesh registered the maximum number of crimes** against children, with Maharashtra and Uttar Pradesh in the second and third places. Among the **Union Territories, Delhi recorded the highest number of crimes** against children (7,118).
 - ✓ The report noted that in percentage terms, **major crime heads under 'Crime Against Children' during 2020 were Kidnapping & Abduction (45.0%)** and Protection of Children from Sexual Offences Act (**POCSO), 2012 (38.1%)**, including child rape.

Constitutional provisions wrt Children:

- **Article 21 A:** The State shall provide free and compulsory education to all children of the age 6- 14 years.
- **Article 24:** Prohibits employment of Children below the age of 14 years in any factory or mine or in any other hazardous activity.
- **Article 39(f):** Directs that children are given opportunities and facilities to develop in a healthy manner and in conditions of freedom and dignity and that childhood and youth are protected against exploitation and against moral and material abandonment.
- **Article 45:** The State shall endeavour to provide early childhood care and education for all children until they complete the age of six years.
- **Article 243G:** Provides for institutionalisation of childcare by seeking to entrust programmes of women and child development to Panchayat (item 25 of Schedule 11).

Policies:

- **Protection of children from sexual offences Act, 2012 (POSCO Act):** The Act was enacted to protect the children from various types of sexual offences and to establish Special Court for providing speedy disposal of cases.
- **The Juvenile Justice (Care and Protection of Children) Act, 2015:** This Act was enacted to consolidate and amend the law regarding juvenile in conflict with law and children in need of care and protection by providing proper care, protection and treatment.

Some International Efforts:

- **The Global Partnership and Fund to End Violence Against Children** were launched in July 2016 by the UN Secretary-General. The Partnership is the only global entity focused solely on Sustainable Development Goal 16.2: ending all forms of violence against children by 2030.
- **Together for Girls** is a global partnership working to end sexual violence against children and adolescents.
- **We Protect Global Alliance** brings together governments, the private sector, civil society and intergovernmental organisations to develop policies and solutions to protect children from sexual exploitation and abuse online.
- **We PROTECT**, established by the UK Government as a global multi-stakeholder response to combating online child sexual abuse.

WAY FORWARD:

- **Comprehensive Sex Education:** Implement age-appropriate and comprehensive sex education programs in schools. E.g., Good Touch and Bad Touch, etc.
- **Community Awareness Campaigns:** Conduct widespread awareness campaigns to educate communities about the signs of child sexual abuse, the importance of reporting, and available support services.
- **Strengthen Legal Framework:** Enhance and strictly enforce laws related to child sexual abuse, ensuring swift justice and stringent penalties for offenders.
- **Technology Regulation:** Regulate online platforms and monitor online activities to prevent the exploitation of children through the internet.
- **Parental Education Programs:** Conduct programs to educate parents on recognizing signs of abuse, communicating with children about safety, and fostering open dialogue at home.
- **Victim-Centric Approach:** Adopt a victim-centric approach in legal proceedings, providing protection and support for the child throughout the investigative and judicial processes.

2) THE PROTECTION OF CHILDREN FROM SEXUAL OFFENCES (POCSO) ACT, 2012:

- This law represents **the first comprehensive effort to safeguard children from sexual assault, sexual harassment, and pornographic violations**. It also entails the **establishment of special courts** dedicated to the trials of such cases.

Key features:

- **Protecting victim's identity:** The Act strictly prohibits the disclosure of a victim's identity through any form of media, except when authorized by the special courts established under the Act.
- **Gender-neutral legislation:** The Act provides a gender-neutral definition of a child, encompassing 'any person' under the age of 18.
- **No reporting time limit for abuse:** Under this Act, victims are entitled to report an offense at any time, even if years have passed since the abuse occurred.
- **Non-reporting as a crime:** Any individual responsible for an institution (excluding children) who neglects to report a sexual offense involving a subordinate is liable to face legal consequences.

A) PROTECTION OF CHILDREN FROM SEXUAL OFFENCES (AMENDMENT) ACT, 2019

POCSO amendment Act, 2019, defines what 'child pornography' is; 'using a child for pornographic purposes' and for 'possessing or storing pornography involving a child' is punishable. It has also widened the ambit of 'aggravated sexual assault'.

- The act seeks to provide more stringent punishment, **including death penalty**, for sexual crimes against children.
- It refers to the judgments of the Supreme Court in ***Machhi Singh (1983)*** and ***Devender Pal Singh (2002)*** in which the court had held that the death penalty can be awarded only in rarest of rare cases.

Concerns over death penalty

- The Justice **J.S. Verma Committee**, which was constituted in 2013 in the aftermath of the Nirbhaya case, after due deliberations found itself against the imposition of death penalty in rape cases.
- The **262nd Report of the Law Commission of India, 2015**, also provides for abolition of the death penalty except in terror cases.

B) POCSO RULES 2020:

- **Interim Compensation and Relief (POCSO Rule-9):** Rule-9 allows the Special Court to order interim compensation for a child's relief or rehabilitation needs after FIR registration.
- **Immediate Special Relief Payment:** POCSO Rules empower the Child Welfare Committee (CWC) to recommend immediate payment from District Legal Services Authority (DLSA) or District Child Protection Unit (DCPU) funds for essential needs like food, clothes, and transportation. Payment must be made within a week of CWC's recommendation.

- **Support Person Provision (POCSO Rules):** CWC has the authority to appoint a support person to assist the child during investigation and trial, ensuring the child's well-being, access to medical care, counseling, education, and keeping the child and guardians informed about court proceedings.

Shortcomings of the POCSO Act:

- **Problem with the application of the last seen theory:** The last seen theory can lead to wrongful conviction in several cases and therefore, it cannot be applied without circumstantial evidence.
 - ✓ It was held by the **Supreme Court in the case of Anjan Kumar Sarma v. State of Assam** that the last seen theory is a weak piece of evidence and cannot be relied upon single-handedly.
- **Unprepared investigation machinery:** The investigation machinery in the child sexual abuse cases is not well acquainted with the procedure which leads to a faulty investigation.
 - Low Women Police Representation
 - Despite the act's one-month investigation timeline, delays occur due to resource constraints, forensic evidence acquisition delays, and case complexities.
- **Silent on consensual sexual activities:** In case of sexual intercourse with consent, one of which is minor, the partner who is not minor can be prosecuted under the POCSO Act as the consent of a minor is not considered relevant under this Act.
- **False complaints by children are not punishable:** Section 22 of the POCSO Act provides for the punishment to the persons who file a false complaint to humiliate, extort, threaten, or defame another person.
 - ✓ However, a child is exempted from any such punishment which is a loophole as many people take advantage of this exemption and misuse this provision.
- **Pending cases:** Although, the POCSO Act specifies that "the Special Court shall complete the trial, as far as possible, within a period of one year from the date of taking cognizance of the offence" under Section 35(2) but the number of pending cases is rising which is creating a huge problem in making the justice mechanism effective.

Way forward/Suggestions:

- Nationwide awareness programs on the POCSO Act will encourage reporting and educate investigating agencies for better implementation.
- Special Police Units for POCSO crimes in each district, with counsellors and child welfare experts will facilitate sensitive handling of cases.
- Fast Track Special Courts under the Act must be set up in each district for time-bound trials and increased conviction rates.
- Provisions on rehabilitation of victims through education, vocational training must be incorporated.
- The Act should be amended to cover consensual sexual relations between children aged 16-18 years and recognize male child abuse victims.
- Timelines must be defined for medical examination and collection of forensic evidence after complaint filing for better results.

C) LAW COMMISSION REPORT: AGE OF CONSENT UNDER THE POCSO ACT, 2012

Recently, Law commission has recently come up with Report #283 Titled: Age of Consent Under the POCSO Act, 2012, in which it has **advised against changing the present age of consent under POCSO act which is 18 years.** (Section 2(1)(d) of POCSO act defines: 'child' means any person below the age of eighteen years). Issues related to age of consent under POCSO Act:

- The POCSO Act mandates a minimum sentence of 10 years for statutory rape, disregarding the consent of minors aged 16-18. The act maintains a gender-neutral stance.
- Since the enactment of the POCSO Act in 2012, there has been a **rise in the age of consent from 16 to 18 years.** This led to an **increase in the prosecution of adolescents** engaged in consensual sexual activities among minors.

This has following concerns:

- Leads to **shame and stigma associated with criminalization** of consensual sexual activity.
- While these cases do not necessarily lead to conviction, the stringent law **results into denial of bail** and prolonged incarceration.
- Most people adversely affected with this provision are youth from poor and marginalized population.
- A **UNICEF India study conducted** in West Bengal, Assam, and Maharashtra revealed that **one in every four cases under the POCSO Act involved 'romantic cases and consensual relationships.**
- Often when the children (below 18) who elope or marry, **the male partner is sent to jail and the women is usually pushed towards a life of poverty** and destitution (**observed in Veekesh Kalawat vs State of MP**)
- The state is not obligated under POCSO to provide the basic minimum required for the survival of the female and/or her child.

Views of Law Commission against reducing age of consent:

- Existing age of consent (18 years) **should not be tinkered due to dangers of child abuse, trafficking, and prostitution.**
- Consent can be manipulated, thus a lot of genuine cases falling under POCSO might not see trial on account of agencies declaring them to be cases of consensual romantic relationships.
- In many cases, '**consent' arises after the occurrence of alleged offence**, thus reducing age of consent can provide escape to child abusers.
- Can lead to negative fallout on fight against child marriages.
- **Emerging trends of grooming and cybercrimes such as sextortion against women**, increase vulnerability of children to sexual exploitation necessitate a need for stringent protection.
- Provide a **gateway to abuse of law leading to coercion of minor girls into subjugation, marital rape, and trafficking.**

Way forward/Suggestion:

- Law Commission has suggested for introducing guided judicial discretion to deal with situation in case where there is tacit approval on part of child aged between 16 to 18 years.
- However, scholars have emphasized placing the child at the centre while formulating laws, while POCSO serves protection of young from sexual abuse, equally important is to protect young from being shamed, punished and jailed for exploring what is developmentally appropriate for their age.
- Age-appropriate sexuality education should be given in schools.
- Access to confidential medical counselling.
- Prohibiting laws from criminalizing consensual sexual activity with peers.
- Courts to address these matters with sensitivity and increased public dialogue.
- 'Close-in age' exception in case of consensual relationships as followed in USA and Canada can be looked into.

2. GENERAL STUDIES-3

1) ECONOMY: DEVELOPING CORPORATE BOND MARKET IN INDIA

About Bonds:

- A bond is a debt instrument signifying a loan extended by an investor to a borrower, usually a corporation or government entity.
- Governments and corporations frequently utilize bonds as a means of borrowing funds for various purposes.
- Governments, at all levels, use bonds to finance infrastructure projects like roads, schools, dams, and to address sudden expenses related to emergency such as pandemic, wars, etc.
- Similarly, Large organizations often require amounts beyond what typical banks can provide, leading them to issue bonds and borrow from both institutional and retail investors.

Present status of corporate bond market in India:

- India's corporate debt to GDP ratio was 17%, contrasting with 123% in the US and 19% in China.
- A larger proportion of Indian firms rely on banks as their primary source of working capital compared to many other developed nations.
- The underdeveloped nature of the corporate bond market in India is evident from these trends.

Need for developing corporate bond market:

- **Meet investment needs:** Economic Survey 2018-19 has highlighted that India needs to shift gears from consumption-driven economy to investment-led economy wherein private sector investment has to become key driver.
- **Reduce pressure on government and banks:** In India, given the **absence of a well-functioning corporate bond market**, the burden of financing infrastructure projects such as roads, ports, and airports are more on banks and the government.
- **Asset-Liability mismatch:** Banks use short-term deposits (3-5 years maturity period) to fund long term infrastructure projects with long gestation period leading to asset-liability mismatch.

- **Reduce foreign currency exposures:** Corporate bond market enables firms to borrow for longer maturity periods in local currency to meet their investment needs and avoid foreign currency exposures.
- **Provide long term financial assets:** An active corporate bond market could provide institutional investors such as insurance companies and provident and pension funds with quality long term financial assets.
- **Diversified Funding Sources:** Developing the corporate bond market in India provides companies with an alternative and diversified funding source beyond traditional bank loans.
- **Lower Financing Costs:** A well-functioning bond market can potentially lead to lower borrowing costs for companies, making capital more accessible at competitive rates.
- **Infrastructure Development Support:** A thriving bond market facilitates funding for large-scale infrastructure projects, aligning with the country's developmental goals.
- **Global Competitiveness:** A well-established bond market enhances India's global competitiveness by providing a sophisticated financial infrastructure attractive to international investors.
- **Risk Management:** Corporate bonds offer effective risk management tools, allowing companies to hedge against interest rate fluctuations and other financial risks.

Reasons for underdeveloped bond market in India:

- **Narrow investor base:** Demand for corporate bonds as an investment is mostly confined to institutional investors with retail investors accounting for only 3% of outstanding issuances.
- **Dominance of government securities:** Central and state government securities constituted almost half of the total investment in the bond market.
- **Constraints on foreign investors:** Investment limit for FPIs in corporate bonds has been enhanced along with a reduction in the withholding tax. However, FPIs are not fully utilising enhanced limits due to limited liquidity in the market.
- **Absence of longer maturity bonds:** Corporate bond market is basically dominated by bonds with average maturity period of 2-5 years. This market has not been able to cater the long-term investors such as pension and insurance fund companies through issuance of long-term maturity bonds.
- **Lack of risk management market:** Absence of interest rate/ credit derivatives which can efficiently transfer the risks arising out of interest rate movements.
- **Taxation Structure:** Stamp duties on corporate bonds across various states have not been standardised.

Way Forward:

Several reports by expert committees on development of corporate bond markets in India such as **R. H. Patil Committee (2005)**, **High Powered Committee on Making Mumbai an International Financial Centre in 2007 (Percy Mistry Committee)**, **H.R Khan Committee on Corporate Bond Market**. Important recommendations:

- **Easing the process of bond issuance:** To incentivise corporates to raise a part of their requirements through bonds, time and cost for public issuance and disclosure and listing requirements should be reduced and made simpler.
- **Enhancing Investor Base:**
 - ✓ the scope of investment by provident/pension/ gratuity funds and insurance companies in corporate bonds should be enhanced.
 - ✓ Retail investors should be encouraged to participate in the market through stock exchanges. Such investors should also be encouraged to participate in the corporate bond market through mutual funds.
 - ✓ Investment in corporate bonds should be considered as part of total bank credit while computing credit deposit ratio by banks.
- **Bonds Primary Issuance Database:** A centralised database of all bonds issued by corporates; made available free of cost to all the investors.
- **Municipal bond market:** Municipal bonds may be given some fiscal support in the form of bond insurance so that municipalities are encouraged to issue such bonds.

Link:<https://indianexpress.com/article/explained/explained-economics/jp-morgan-indian-government-bonds-8959037/>

<https://www.thehindu.com/business/deeper-bond-markets-critical-to-finance-energy-transition/article67408542.ece>

2) ECONOMY: SEMICONDUCTOR MANUFACTURING IN INDIA

About Semiconductors:

- Semiconductors are materials which have a conductivity between conductors and insulators. Semiconductors can be pure elements, such as silicon or germanium, or compounds such as gallium arsenide or cadmium selenide.
- A semiconductor chip is a network of semiconductors, also called integrated circuits or microchips.
- End-use industries dependent on semiconductors include mobile devices, telecom equipment, industrial machinery, computing devices, automobiles etc.

Significance of semiconductor industry for India

- **Economic and Industrial growth:**
 - ✓ According to the Electronics and IT Ministry, semiconductor demand in India would increase to \$70- \$80 billion by 2026 with the growing demand for digital devices and electronic products (mobiles & laptops etc).
 - ✓ This will create numerous employment opportunities for the Indian youth.
 - ✓ Further, India would be required to import fewer semiconductor chips which would decrease the import bill.
 - ✓ Production of semiconductors in surplus of domestic requirement will enable the country to meet export demand as well.
- **National security:** Semiconductors are essential components in many critical industries, including defence, telecommunications, power transmission etc that have implications for national security.
 - ✓ Chips made locally will be designated as ‘trusted sources’ and can be used in products ranging from CCTV cameras to 5G equipment.
- **Geopolitical benefits:** Self-sufficiency will decrease reliance on chinese chip imports especially during hard times like the recent Galwan Valley border clash.
 - ✓ The program will attract large global chip makers to make India their production base, fulfilling the government’s vision for Atmanirbhar Bharat.
- **Supply chain resilience:** The COVID-19 pandemic highlighted the vulnerabilities of global supply chains, including those in the semiconductor industry.
 - ✓ The pandemic and the subsequent lockdowns impacted the supply of chips to India. Automobile manufacturers like Mahindra & Mahindra and Tata group were compelled to reduce their production due to the shortage.
- **Technological Leadership:** Semiconductors are the building blocks of today’s technology. Semiconductor chips are widely used in (a) Computers and laptops; (b) Phones, mobile devices and other electronic gadgets; (c) Automobiles; (d) Aviation; (e) Medical devices especially diagnostics; (f) Military equipment among others. These semiconductor chips are the drivers for ICT (Information and Communication Technologies).

Semiconductor at Global level:

- The semiconductor chip-making process is complex and requires high precision and technological expertise. Manufacturing processes have multiple steps in the supply chain such as designing software for chips and patenting them through core Intellectual Property (IP) rights.
- The global semiconductor industry is currently valued at \$500-\$600 billion.

- **Major Producer:** Presently, **Taiwan is the world leader** in manufacturing microchips with producing over 60% of the world's semiconductors and over 90% of the most advanced ones.
- **Globally, the entire value chain** has seeped in the interdependence between a handful of countries like the **USA, Taiwan, Japan, China**, and some European nations.
- However, this value chain has witnessed two key disruptions in the last few years.:
 - ✓ **US-China conflict:** Presently, USA and China are engaged in trade and technology conflict.
 - The **USA passed the CHIPS and Science Act**, providing subsidies for manufacturing chips in the country, **formed the “Chip 4 Alliance”** and imposed additional restrictions on the Chinese semiconductor industry.
 - In a similar manner, China put curbs on the exports of germanium and gallium, two niche metals used in the manufacturing of semiconductors.
 - ✓ **COVID-19 Pandemic:** Lockdowns disrupted the functioning of these semiconductor manufacturing units and its forward & backward linked supply chains. This created a demand-supply mismatch and resulted in long-pending orders with end-use industries.

India's Role:

- India has **positioned itself as a player in the critical semiconductor technology** field providing an opportunity for companies **to diversify their bases from China**.
- **Market Size:** Reports project India's semiconductor market to value **about \$64 billion by 2026**, showing three-times growth from 2019. According to the India Electronics and Semiconductor Association (IESA), semiconductor consumption in India is growing at a rate of 15.1%.
- **Chip Design:** India has become the hub for semiconductor design with nearly 2,000 chips being designed per year.
- **R&D in the industry:** Research and development (R&D) in this industry, which includes electronic products and embedded systems, generated about US\$2.5 billion in revenue.
- However, 100% of our chips, memory, and display **are imported into the country, 37% coming from China**. Chips import bill is estimated to touch \$100 billion by 2025 from \$24 billion now.
- **India can be a major beneficiary of Taiwan's New Southbound Policy**, focusing on shifting its trade and investments from China to Southeast Asia and South Asia.

Challenges faced in India:

- **High Cost of establishment:** Fabs are highly capital-intensive undertakings, costing billions of dollars for large facilities. As per a government estimate, it would cost roughly \$5-\$7 billion to set up a chip fabrication unit in India.
- **Infrastructural requirements:** There are often challenges in meeting the infrastructural requirements of a cluster of semiconductor manufacturing fabs such as continuous supply of water, uninterrupted electricity etc.
- **Long gestation:** A state-of-the-art fab can take up to five years before going into full production but requires full financing and continuous supply of labour during the gestation period.

- **Delays in setting up facilities:** Three entities that had applied to build the chips are all facing hurdles in setting up their plants – potentially delaying their manufacturing bases.
- **Shortage of skilled workforce:** There are hardly any semiconductor engineers trained in the knowledge of device physics and process technology.
- **Need for the ecosystem:** Beyond locating and building structures, fabs require a variety of high-purity gases and wafers to fabricate the chips. Presently, India has to import many of these raw materials from external sources.

Semiconductor manufacturing policies in India:

- **National Policy on Electronics 2019:** It envisions positioning India as a global hub for Electronics System Design and Manufacturing (ESDM) sector.
 - ✓ It aims to encourage the development of core components, including chipsets.
- **Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS):** The government will provide a **financial incentive of 25% on capital expenditure** for a list of products that constitute the supply chain of electronic products.
 - ✓ This includes products such as electronic components, semiconductors, and specialized sub-assemblies.
- India launched its **India Semiconductor Mission (ISM)** in 2021 and **Production Linked Incentive (PLI) scheme for the semiconductor industry.**
- **About Modified Semicon India Programme:**
 - ✓ **Ministry:** Ministry of Electronics and Information Technology.
 - ✓ **Objective:** It aims to provide attractive incentive support to companies/consortia that are engaged in Silicon Semiconductor Fabs, Display Fabs, Compound Semiconductors, Semiconductor Design (Design Linked Incentive Scheme for nurturing 100 domestic companies of semiconductor design) etc.
 - ✓ **Tenure:** Support under the scheme will be provided for six years.
 - ✓ **Nodal Agency:** India Semiconductor Mission, within Digital India Corporation, MeitY is the designated nodal agency for implementing the programme.
- In 2022, India signed **India-US Initiative on Critical and Emerging Technologies (iCET) deal** which enables India to access technologies associated with manufacturing of high-end semiconductors and chipsets.

Way Forward:

- **Ecosystem Development:** Develop a strong ecosystem for the semiconductor industry to include supply chain management besides design and manufacturing facilities.
- **Skill Development:** India, with its demographic dividend, must focus on training the highly skilled labour required for the semiconductor industry.
- **Increased focus on R&D:** Increase spending on research and development and develops an innovation culture.

- **Incentivising Industry:** There is a need for incentivising industry to collaborate with academia to provide training and internship opportunities to students and invest in R&D to develop new technologies.
- **Partnership:** Strengthen partnerships with countries such as the USA, Taiwan and Japan for supply chain efficiency and availability of necessary raw materials and technologies.
- **Attracting foreign companies:** India needs to enable a conducive environment for attracting foreign companies to set up their manufacturing bases in India.



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YOJANA (OCT) - INFRASTRUCTURE

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1. GENERAL STUDIES-3:

1) UNITY MALLS

- In the Budget 2023-24, Union Finance Minister unveiled a remarkable initiative - the establishment of a 'Unity-Mall' in each state of the country.
 - These malls are envisioned to be strategically located, preferably in the respective state capital, financial capital or one of the prominent tourist centres.
 - **Mall Design, Amenities and features:** The Department of Expenditure in the Ministry of Finance, GoI, has issued comprehensive guidelines to States regarding the construction of Unity Malls:
 - » The architectural design of these malls should signify India's Unity and Grandeur. They are required to have a standardized signage design, as prescribed by Department for Promotion of Industry and Internal Trade (DPIIT). It should also incorporate ODOP logo and Make in India logo. Additionally, the states are encouraged to explore the use of multilingual signage, showcasing India's rich linguistic diversity.
 - » **One Shop(Space) for every state/UT:** The guideline further stipulates that each unity mall should have minimum 36 commercial spaces, with one designated for each state or UT for the sale and promotion of ODOP products. These spaces should have uniform floor space and should be subjected to consistent rental provisions. This is to ensure equitable representation of nation's diversity.
 - It will enable sale of GI products, ODOP offerings and other prominent regional products.
 - » Each unity mall should also allocate commercial space of equal size for every district within the state, including those districts that have been announced by not yet formally notified.
 - » The design should also incorporate flexibility to accommodate the expansion of commercial spaces as needed.
 - » **Range of Essential features:** State-of-the art food court, ample parking facilities, and purpose-built spaces for recreational and cultural activities, all tailored to their respective scales. Functional areas for conferences, events, galleries and exhibitions should also be incorporated into the design.
 - » These malls should also offer technology-driven experience such as VR, AR, Digital displays, and interactive Kiosks.
 - » Special attentions must be devoted to ensure convenience and accessibility in compliance with National Building Code standards.
 - » States have also been urged to provide financial assistance to facilitate the participation of sellers from distant regions and remote districts.
 - They are also supposed to empower local ODOP sellers by implementing capacity building programs.
 - » States are also encouraged to undertake promotional activities aimed at establishing Unity Malls as vibrant cultural hubs and attractive tourist destinations.
 - » To ensure long term sustainability of Unity Malls, their operation and maintenance will be structured under PPP model.
 - In this arrangement ownership of the mall remain with the state government, while O&M responsibilities will be entrusted to private players.

- A concession period of 30 years have been recommended for this PPP.
 - Furthermore, states are expected to commit to covering the operational expenses of the malls if such support become necessary.
 - » In case a state/district chooses not to participate in the mall, the private party responsible for Malls' O&M will actively seek out sellers who can showcase and sell ODOP products in the commercial spaces designated for that specific state or district.
 - » Artisans who are not able to get space within the mall, will be periodically allocated exhibition spaces allowing them to display and sell their products.
- **Approval Procedure and State of Implementation:**
- » DPR is submitted to the DPIIT which meticulously evaluates and then subsequently recommends an amount, not exceeding the amount allocated for the state, to the Department of Expenditure which grants final approval and disburse the funds.
 - » So far, final approval for construction of Unity Mall in 8 states have been given. These include Assam, Chhattisgarh, Gujarat, MP, MHA, Meghalaya, Nagaland and Tripura.
- **Support from Centre:**
- » As part of the Scheme for Special Assistance to States for Capital Expenditure (interest free 50-year loan), a substantial sum of Rs 5,000 crore has been specifically earmarked to extend financial support to states for the construction of Unity Mall.
 - The amount is allocated to states based on the number of districts.
- **Contribution of States:**
- » State will provide land for the malls free of cost and may also allocate additional funds for the project from their budget.
- The initiative to establish Unity Malls throughout the nation draws inspiration from the successful 'Ekta Mall' in Kevadia, Gujarat.
- **Advantages:**
- » It will advance infrastructure development throughout the country and stimulate capital investment within the states.
 - » **Contribute to overall economic prosperity:**
 - Expedite progress towards 'Make in India' and 'Atmanirbhar Bharat' initiative.
 - Offers local artisans opportunities to showcase and sell their products, create employment opportunities and facilitate skill development.
 - It also bolsters tourism.
 - » Foster national unity and diversity:
 - Champion local cuisine
 - Celebrate cultural heritages.
- **Conclusion:**
- » This unique initiative of GoI is poised to play pivotal roles in fostering economic development, providing citizens with recreational spaces, enhancing tourism, and celebrating the rich cultural heritage of our diverse and unique nation distinctively.

2) ROAD INFRASTRUCTURE GETTING SMARTER

- **Introduction:**
 - India has the 2nd largest road network in the world with 63.71 lakh kms of roads. Road transport is the dominant transport sector in India, both in terms of traffic and in terms of contribution to National Economy (3.08% of GVA (out of total 4.6% by transport sector)).
- **Types of roads in India**
 - India's road infrastructure is categorized into six categories:
 - i. **National Highways:** 1.32 lakh kms
 - These are the primary roads of the country and connect large cities and big industrial areas.
 - Their development and maintenance are the responsibility of central government.
 - **Further need of development of National Highways:**
 - » Out of the total roads, only 2.06% is **national highway**, but its carrying capacity is 40%.
 - » Higher the density of National Highway -> Higher the inter-state trade (Export + Import) as percent of GSDP (ESI)
 - » A positive relationship exists between density of NHs and the per capita income in Indian States.
 - » Presently, more than 70% of NHs are either **two lane or less**. Thus, there is a lot of scope of improvement.
 - ii. **State Highways:** 1.79 lakh kms
 - These roads link all the important centre of industry, trade and commerce of the state and National Highways
 - iii. **District Roads:** 6.12 lakh kms
 - These roads connect different parts of the district, important industrial centres and market centres and usually lead to local railways stations
 - iv. **Rural Roads:** 45 lakh kms
 - These roads are found in villages and usually are of two types - *Pucca (or metalled)* and *Kutcha (or non-metalled)*. They constitute 70% of roads in India.
 - v. **Urban Roads:** 5.41 lakh kms
 - vi. **Project Roads:** 3.43 lakhs kms
- **Rate of Growth of Road Development in India**
 - The CAGR of total road length since 1991 to 2019 has been 3.64%. This CAGR between 1951 and 1991 was 4.50% on a much lower base.
 - The total road length in 1951 was 4 lakh kms; in 1991 it was 23 lakh kms and in 2019 it was 62 lakh kms.
 - So, in last 28 years (1991-2019), about 40 lakh kms of road has been added in the country.
- **Key Reasons for improvement in road construction** (both quality and quantity) in the last 3 decades:
 1. **Delinking Road Development and Direct Employment:**
 - » Until the liberalization reforms (i.e., 1991), the road development was also connected with direct employment leading to labor intensive construction and also putting a cap on the quality of roads.

- » After 1991, the mindset changed and the use of capital intensive high-tech road making equipment was brought into use.
- 2. **Creation of National Highway Authority of India (NHAI):**
 - » NHAI became operational in 1995, which increased the focus on and quality of NHs. Before this NH development and maintenance was the responsibility of the state with funding from the centre.
- 3. **Creation of State-Level Road Development Corporations:**
 - » After the formation of NHAI, many states started thinking of better organizational forms than the PWD for road development under its charge.
 - For e.g., Maharashtra was first state to set up the Maharashtra State Road Development Corporation Limited (MSRDCL) in Aug 1996. It developed Pune-Mumbai expressway.
- 4. **Bringing In PPP Partnership:**
 - » Initially, the concession agreements were loaded in favor of government and thus attracted very few private players in limited low risk projects.
 - » **New Contracting Models and Asset Monetization** also increased PPP's success.
 - BOT (Toll and Annuity)
 - HAM
 - Toll Operate Transfer (TOT) operational model.
- 5. **Starting of NHDP**
 - » Started in 1998, this was the biggest road development projects in India (till Bharatmala was launched). It had two major components: the Golden Quadrilateral and the North-South & East West Corridors.
- 6. **Pradhan Mantri Gram Sadak Yojna** launched by MoRD during the Vajpayee regime is the most successful rural road development project in the country. Its success can be attributed to three reasons:
 - » **Selection of villages for connectivity based on objective criteria**.
 - » **Overseeing from independent agencies**, including world bank
 - » **Keeping the project under MoRD rather than MoRTH**
- 7. **Viability Gap Funding (VGF):** When PPPs were hardly forthcoming for GQ project, the government came up with the idea of mitigating risks by providing VGF with a cap of 40% of the project cost. This increased the interest of bidders and many projects after phase 1 were done through PPP projects.
- 8. **Increased focus on Expressways:** The first access-controlled expressways for fast and streamlined movement was opened between Mumbai and Pune in 2002. While the construction of expressway had a slow start, it has picked up in last 10 years. As of Aug 2023, India has about 5,000 km of operational express way, and other 9,000 kms under construction.
- 9. **Creation of Focused Organizations:**
 - » Indian Highway Management Company Limited (IHMCCL) was set up to carry out electronic tolling.
 - » National Highways & Infrastructure Development Corporation Limited (NHIDCL) was formed to develop roads in border states.

- » National Highways Logistic Management Limited was set up in 2020 for developing Multi-Modal Logistic Parks (MMLPs) and the first/last mile port connectivity projects.

10. Improvement in Road Making Technology:

- » As the NHDP rolled out, the import of road infrastructure was brought under Open General License, making it easy for procurement. Further, using the transfer of technology mechanism, domestic manufacturing was encouraged.

11. Electronic Toll Collection (ETC):

- » It reduced the toll collection time and consequent waiting.
- » But this technology needs to further evolve, like in developed countries, to the point where vehicles need not slow down for the electronic payments but can have it done while travelling at the maximum speed.

- Some key challenges which continue and need to be worked upon:

- **Safety:** India roads record more than 1.5 lakh deaths every year making Indian roads the deadliest in the world.
 - There is a need to improve engineering, promote awareness among drivers to avoid rash driving; ensuring buffer lanes for turns; and providing for sufficient roadside parking.
- **Urban Roads (i.e., the city roads)** suffer from a lot of congestion in almost all cities and hampers first/last mile connectivity.
- **Lane Kms vs Road Kms:**
 - As more multiple lane roads get constructed, it's important to measure lane kms. This will not only help us measure length but also the capacity.
- **Origin to Destination (OD) Data:**
 - For future planning and development of road network, it is important to get OD data. This can also be used for ETC.
- **Better Coordination with PPP players:**
 - Significant time and energy are wasted in disputes between the PPP players and the authority. Projects get delayed leading to significant inconvenience.

- Conclusion:

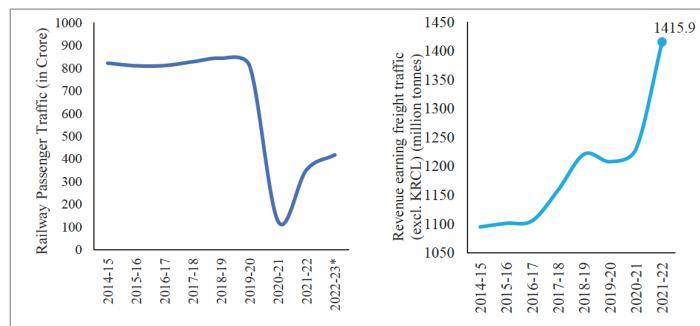
- Given the traction that India has built on road infrastructure, we should hope that the challenges are addressed and the momentum enhanced for development

3) RAIL INFRASTRUCTURE

- Railways in India began in **1853**, when the first train steamed off from **Mumbai to Thane**, a distance of **34 kms**.
- From that modest beginning today, Indian Railways have grown into vast network of more than 7,000 stations, over 68,000 kms of route length and around 130,000 bridges. It is the fourth largest railway network in the world under single management.
- The Indian railways is also one of the **largest employers** in the country by employing more than **13 lakh workmen**.
- **Railway Passenger and Freight Traffic** (as per ESI 2022-23)
 - Passenger Traffic was 809 crore in FY20 which dipped to 125 crore in FY21 and has recovered to 351.9 crore in 2021-22.

- During the **FY20**, IR carried 1.2 billion tonnes of freight and 8.1 billion passengers - making it the world's largest passenger carrier and fourth largest freight carrier. The freight was sustained by IR despite the COVID-19 lockdown. Between FY21 and FY22, there was a sharp increase in freight traffic.

Figure XII.7: Railways passenger as well as freight traffic have seen strong growth post Covid-19 period



Note: * For FY23 the data is from April-November, 2022

Source: Ministry of Railways

- Capital Expenditure** on infrastructure in railways has received tremendous boost since 2014. It has seen a continuous increase in the last four years with CAPEX (BE) of Rs 2.5 lakh crore in FY23.

A) OTHER ASPECTS ABOUT RAILWAY INFRASTRUCTURE

- Central Public Sector Enterprises under Ministry of Railways:**
 - There are 12 CPSEs under the administrative control of Ministry of Railways viz. RITES Limited; IRCON International Limited; IRFC; CONCOR; KRCL; MRVC, IRCTC, RCIL; RVNL; DFCCIL; KMRCL; and BCL.
- Research & Development:**
 - The Research Design and Standards Organization (RDSO) at Lucknow is the R&D wing of Indian Railways. It acts as a consultant to Indian Railways in technical matters. It also provides consultancy to other organizations connected with railway infrastructure and design.
- Railway Finance:**
 - Separate Railway Budget in the past:** Since 1924-25, Railway Budget was being presented separately to Parliament since 1924-25 owing to the separation convention. The main reason behind the separation convention was to ensure stability of civil estimates as railway finance used to be a sizable part of the general finance.
 - Merging of the general budget and railway budget** has taken place since FY18. This gives a holistic picture of the financial position of the government. It facilitates multimodal transport planning.
- Railway Electrification:**
 - IR's Mission 100% Electrification** policy is seen as a pivotal for the country's entire energy sector.
 - Advantages:**
 - Reducing crude oil imports and saving forex was the initial motivation.
 - Environment benefits of electrification are becoming more important reasons now.
 - **Better quality of service** is also ensured by electric rails. The average speed is higher.

- » **Progress:** As of March 2023, electrification on IR has been extended to 58,812 Route Kms including Konkan Railways.

- **Rail Tourism:**

- IR connects various tourist destinations in the country and is thus the prime mover of tourism in the country.
- **Under Bharat Gaurav Train Policy**, the railways have introduced **theme-based Tourist Circuit Trains**. This will showcase rich cultural heritage and magnificent historical places to the people of India and the world through professionals of the tourism sector and other potential service providers.
 - » Under this, State Tourism Development Corporations or any other potential service provider may run theme-based tourist circuit trains covering any destination of their choice.
 - » Ministry of Tourism supports this by provision of better quality LHB coaches under Bharat Gaurav Train Policy and gives approximately 33% concession in the charges due to the Railway, for promotion of railway tourism.
- Further, specialized tourism products, mostly train based, are also introduced from time to time in association with IRCTC and selected states

B) NATIONAL RAIL PLAN 2030

- Indian railways have prepared a National Rail Plan (NRP) for India - 2030.
- The plans is to create **future ready** Railway system by 2030.
- The NRP is aimed to formulate strategies based on both **operational capacities and commercial policy initiatives** to increase modal share of the Railways in freight to 45% (at present it is around 27%) and to sustain it.
- **Other aspects:**
 - » Reduce transit time of freight substantially by increasing average speed of freight trains to 50Kmph.
 - » As part of the National Rail Plan, Vision 2024 has been launched for accelerated implementation of certain critical projects by 2024 such as: 100% electrification, multi-tracking of congested routes, upgradation of speed to 160 kmph on Delhi-Howrah and Delhi-Mumbai routes, upgradation of speed to 130kmph on all other Golden Quadrilateral-Golden Diagonal (GQ/GD) routes and elimination of all Level Crossings on all GQ/GD route.
 - » Identify new Dedicated Freight Corridors and new High Speed Rail Corridors.
 - » Assess rolling stock requirement for passenger traffic as well as wagon requirement for freight.
 - » Assess Locomotive requirement to meet twin objectives of 100% electrification (Green Energy) and increasing freight modal share.
 - » Assess the total investment in capital that would be required along with a periodical break up.
 - » Sustained involvement of the Private Sector in areas like operations and ownership of rolling stock, development of freight and passenger terminals, development/operations of track infrastructure etc.

C) VANDE BHARAT EXPRESS

- **Vande Bharat Express** is India's first indigenous semi-high-speed train. It has been manufactured by **Integral Coach Factory, Chennai** and is a successful step towards 'Make in India' and 'Atmanirbhar Bharat'.
- These trains have **ultra-modern features** like quick acceleration, substantial reduction in travel time, maximum speed of 160 kmph, on-board infotainment and GPS based passenger information system, automatic sliding doors, retractable footstools and Zero discharge vacuum bio toilets, CCTV cameras, etc. and other contemporary features as per global standards.
- **As of July 2023**, 50 Vande Bharat Train services are running on the **Indian Railways**, connecting states having **Broad Gauge Electrified network**.
 - The first Vande Bharat Express train was flagged off on **15th Feb 2019**, on the New Delhi-Kanpur-Allahabad-Varanasi route.
- The introduction of trains, including Vande Bharat services, is an ongoing process on Indian Railways subject to operational feasibility, traffic justification etc.



by
Santosh Kumar

PHASE 1
PRE-CUM-MAINS
2 Class/Week
Nov 23 - Jan 24



PHASE 2
TARGET PRELIMS
3 Classes/Week
Jan 24 - April 24



PHASE 3
TARGET MAINS
4 Classes/Week
June 24 - Aug 24



Mode: Offline/Online

COMMENCING FROM

4th Nov 2023

FEE

(Offline) ₹ 20,000/- + GST

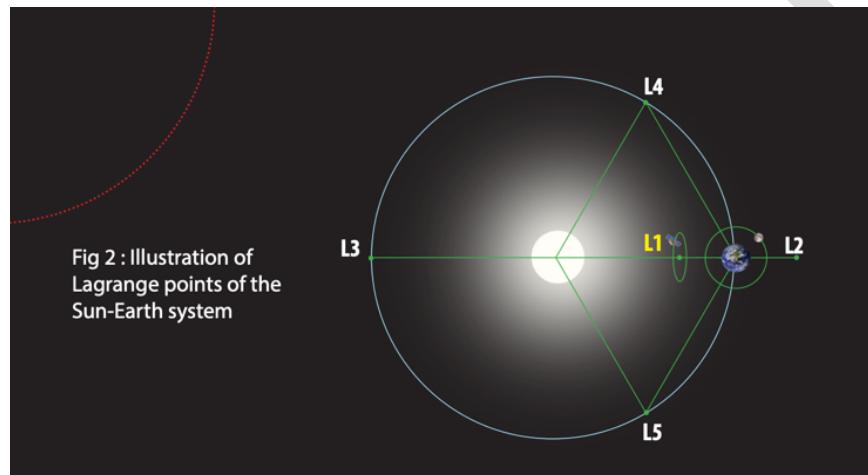
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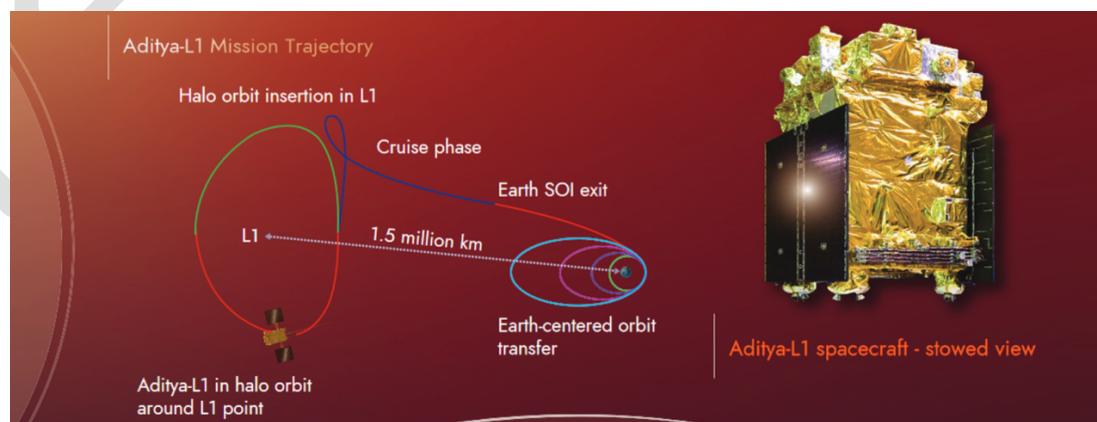
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4) S&T: ADITYA-L1

- It is India's first observatory class space based solar mission. It was launched in Sep 2023 by ISRO. It has a mission life of 5 years during which its payloads will study various aspects of sun. It will be serving as a space weather station and the data from the spacecraft will aid in making models and predicting storms in advance.
- **Why study sun from space and specifically from Lagrangian point 1?**
 - **Why study sun from Space?**
 - Various types of radiations from sun are not able to reach earth due to atmosphere of the earth and earth's magnetic field making their study difficult from earth.
 - **Why from Lagrangian Points?**
 - A Satellite placed in the halo orbit around the Lagrangian point 1 (L1) of the Sun-Earth system has the major advantage of continuously viewing the Sun without any occultation/ eclipses.



- **What Trajectory ADITYA-L1 follows to reach Lagrangian Point-1:** Through various orbit raising manoeuvres and cruise phase, it will be placed in a halo orbit around the Lagrangian Point-1 (L1) of the Sun Earth System, which is about **1.5 million km** from the Earth.



The path Aditya-L1 will take to get to L1. | Photo Credit: ISRO

- **Major Science Objectives:**
 - Understand the coronal heating and solar wind acceleration: It will observe the flow of energy in the sun's outer atmosphere to test competing theories for the heating of sun's corona.
 - Understanding initiation of Coronal Mass Ejection (CME), flares and near earth space weather: By analysing X-Ray radiation, it will seek to understand how violent solar storms are born.
 - To understand coupling and dynamics of the solar atmosphere
 - To understand solar wind distribution and temperature anisotropy.

- **Various Payloads of ADITYA-L1:** It goes with **7 payloads**:
 - a) Visible Emission Line Coronagraph (VELC): It can peek as close as 1.05 solar radii, a region never imaged by any solar telescope. It can thus give us more information about coronal mass ejection.
 - b) Solar Ultraviolet Imaging Telescope (SUIT): It will observe UV radiations from different zones of the solar atmosphere. It will help us to better understand the climate variation on earth.
 - c) Solar Low Energy X-Ray Spectrometer (SoLEXS)
 - d) High Energy L1 Orbiting X-Ray Spectrometer (HEL1OS)
 - e) Aditya Solar Particle Experiment (ASPEX): In-situ measurements of solar particles and ions.
 - f) Plasma Analyzer Package for Aditya (PAPA)
 - g) Advanced Tri-axial High Resolution Digital Magnetometers
 - With the help of e, f, and g scientists can predict probable geomagnetic storms and better understand space weather dynamics.

Conclusion: If the mission succeeds, it will be a resounding vindication of India's investment in space science research, which can on the one hand spur fundamental enquiry of our cosmos and on the other generate knowledge of strong societal relevance.

2) S&T: SPACE INFRASTRUCTURE IN INDIA

- **Background:**
 - Space activities in India began with the establishment of the Indian National Committee for Space Research (INCOSPAR) in 1962. In the same year, work on establishment of Thumba Equatorial Rocket Launching Station (TERLS) near Thiruvananthapuram was also started.
 - ISRO was formed on 15th Aug 1969, and superseded INCOSPAR with an expanded role. In 1972, Space Commission and Department of Space (DOS) were constituted by the GoI, and ISRO was brought under DOS.
 - **ISRO** is the space agency of India. It is involved in science, engineering, and technology to harvest the benefits of our space for India and mankind. It has established major space systems for communication, television broadcasting, and remote sensing. It has also developed satellite launch vehicles like PSLV, GSLV, LVM-3 etc. It also contributes to science and science education in the country. It has launched Indian's NAVIC, Chandrayaan, MOM-1, Aditya-L1 and several other incredible missions.

- **Space Commission** formulates the policies and oversees the implementation of the Indian Space Program to promote development and application of space science and technology for the socio-economic benefit of the country.
- **DOS** implements these programs through ISRO and other associated organizations:

- The Major establishments of DOS and their area of activities are:

A) VIKRAM SARABHAI SPACE CENTRE (VSSC):

- Located in Thiruvananthapuram, it is responsible for design and development of launch vehicle (rocket) technology. Its major programs include, PSLV, GSLV, LVM-3, RLV, Rohini Sounding Rockets etc.

B) UR RAO SATELLITE CENTRE (URSC)

- Located in Bengaluru, it is the lead centre for design and development of satellites including communication, navigation and remote sensing satellites. These satellites provide applications in the areas of telecommunication, television broadcasting, VSAT services, tele-medicines, tele-education, navigation, weather forecasting, disaster warning etc.

C) SATISH DHAWAN SPACE CENTRE (SDSC)-SHAR

- It is the 'Spaceport of India'. It is the backbone of the ISRO in providing launch base infrastructure for the Indian Space Program.
- It is located at Sriharikota, Andhra Pradesh.

D) LIQUID PROPULSION SYSTEMS CENTRE (LPSC)

- It is the lead centre of ISRO for the design, development, and realization of advanced propulsion systems for launch vehicles.
- It is primarily responsible for developing and deploying earth storable, cryogenic, semi-cryogenic, and electric propulsion systems for ISRO's launch vehicles and satellites.
- Its activities are spread across its two campuses, namely, LPSC, Valiamala, Thiruvananthapuram, and LPSC, Bengaluru.

E) SPACE APPLICATION CENTRE (SAC)

- Located in Ahemedabad, it's a major R&D centre of ISRO.
- It develops space borne and air-borne instruments and payloads and their applications for national development and societal benefits.
- For e.g., the communication transponders developed at this centre for the INSAT and GSAT series of satellites are used by the government and private sector for VSAT, DTH, Internet, broadcasting etc.

- It also designs and develops **optical and microwave sensors** for satellites, signal and image processing software, GIS software, and many applications for Earth Observation Program of ISRO.

F) HUMAN SPACE FLIGHT CENTRE (HSFC)

- Set up in 2019, it is the **lead centre** for ISRO's Human Spaceflight program.
- It undertakes **multidisciplinary R&D activities** in new domains of human science and technology while conforming to high standards of reliability and human safety.
- It is **currently focused on Gaganyaan mission** and is working on **end-to-end mission planning, development of orbital module, life support systems, selection and training of astronauts etc.**
- It is **currently operating from ISRO-HQ campus, Bengaluru.**

G) NATIONAL REMOTE SENSING CENTRE

- It is responsible for **establishment of ground centres for receiving satellite data, generation of data products, aerial remote sensing data acquisition, dissemination to the users, development of techniques for remote sensing applications including disaster management support, geospatial services etc.**

H) ISRO PROPULSION COMPLEX (IPRC)

- Located in **Mahendragiri**, it is responsible for **assembly, integration and testing of liquid propulsion systems** for operational and developmental launch vehicles.
- It is also responsible for **qualification, testing and acceptance of liquid engines, cryogenic engines, spacecraft engines etc.**

I) ISRO TELEMETRY, TRACKING AND COMMAND NETWORK (ISTRAC)

- It is responsible for providing **telemetry, tracking and command (TTC), and mission control services to major launch vehicle, laboratory for electro-Optics Systems (LEOS) and Interplanetary Spacecraft missions of ISRO.**
- It is also responsible for **operating the complex ground segment of NaVIC.**

J) MASTER CONTROL FACILITY (MCF)

- It is responsible for **on-orbit Operations (OOP) and Launch & Early Orbit Phase (LEOP) operations of geostationary/geosynchronous & IRNSS class of space crafts of ISRO.**
- It is located at **Hassan in Karnataka.**

K) ISRO INERTIAL SYSTEMS UNIT (IISU)

- Located in Thiruvananthapuram, it is **responsible for design and development of inertial systems for launch vehicles and satellites.** These include **mechanical and optical gyros, Altitude reference systems, accelerometer packages etc.**

L) LABORATORY FOR ELECTRO OPTICS SYSTEMS (LEOS)

- Located in Bengaluru it is responsible for design, development and production of altitude sensors, high resolution imaging optics, and special purpose science instruments for several space crafts.

M) INDIAN INSTITUTE OF REMOTE SENSING (IIRS)

- IIRS, Dehradun, is a premier institute with primary aim to build capacity in Remote Sensing and Geoinformatics and their applications through education and training programs at the postgraduate levels.

N) DEVELOPMENT AND EDUCATIONAL COMMUNICATION UNIT (DECU)

- Located in Ahmedabad, it is responsible for implementation of satellite-based societal applications in the country.
- It is involved in the system definition, planning, implementation, and social research & evaluation of such applications.

O) PHYSICAL RESEARCH LABORATORY (PRL)

- PRL, Ahmedabad is an autonomous body under DOS, and a premier research institute engaged in basic research in the areas of Astronomy and Astrophysics, solar physics, planetary science and exploration, space and atmospheric sciences, geosciences, theoretical physics, atomic, molecular and optical physics etc.

P) NATIONAL ATMOSPHERIC RESEARCH LABORATORY

- Located in Gadanki near Tirupati, it is an autonomous organization engaged in cutting edge research in atmospheric and space sciences with the vision of developing capability to predict the behaviour of the earth's atmosphere through observations and modelling.

Q) NORTHEASTERN-SPACE APPLICATIONS CENTRE (NE-SAC)

- It is an autonomous organization under DOS and Northeastern Council (NEC). It has the mandate of providing space-based governance and development by taking up projects in the fields of natural resource management, infrastructure planning, healthcare, education, emergency communication etc.
- It also conducts training and capacity building in the field of geospatial technology and UAV based remote sensing applications.

R) INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY

- Established in 2007 at Thiruvananthapuram, it is Asia's first Space University. It aims to provide high quality education in Space S&T to meet the demands of the Indian Space Program. It offers undergraduate, postgraduate, doctoral and post-doctoral programs.

S) ANTRIX CORPORATION LIMITED (ACL)

- It is a GoI company under the administrative control of DOS.
- It is engaged in providing space sector products and services worldwide ranging from supply of hardware and software, earth observation and scientific missions, transponder lease services, launch services etc.

T) NEW SPACE INDIAN LIMITED (NSIL)

- Incorporated in 2019, it is a CPSE, under the administrative control of DOS. It focuses on commercially utilization of R&D work of ISRO centres and other DOS constituents.
- The emergence of NSIL would spur the growth of Indian industries in the space sector and enable Indian industries to scale up manufacturing and production base.

U) INDIAN NATIONAL SPACE PROMOTION AND AUTHORIZATION CENTRE (IN-SPACE)

- It is an independent nodal agency under Department of Space (DoS). It was set up in 2020 to boost commercialization of Indian Space Activities and encourage private sector participation.
- It will permit and oversee the following activities of non-Government Private Entities (NGPEs):
 - Building of launch vehicles and satellites and providing space-based service as per the definition of space activities.
 - Sharing ISRO infrastructure/premise etc.
 - Establishment of temporary facilities within the premise of ISRO
 - Establishment of new space infrastructure and facilities, by NGPEs, in pursuance of space activities based on safety norms and other statutory guidelines and necessary clearance.
 - Building of Spacecrafts by NGPEs for registration as Indian satellites and all associated infrastructure
 - Using of spacecraft data and rolling out of space-based services and all other associated infrastructure for the same.



CURRENT AFFAIRS PROGRAM

PRE-CUM-MAINS 2024

OCT 2023: BOOKLET-6

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1) SOCIAL JUSTICE: MEDICAL TERMINATION OF PREGNANCY/ ABORTION

- Why in news recently?
 - SC disallows abortion of a 26-week pregnant women (Oct 2023)
- Example Questions
 - Discuss the key reasons for increasing unsafe deliveries in the country. In this light discuss how the 2021 amendment to the Medical Termination of Pregnancy Act, 1971 resolve these issues. [15 marks, 250 words]
- Introduction
 - Abortion refers to the removal or expulsion of an embryo or fetus from the uterus, resulting in, or caused by, its death. In India, abortion is allowed only in some cases. This has led to large number of unsafe abortions in the country.
- Legal Provisions Regarding Abortion in India
 - Section 312 of IPC made abortion under any circumstances, except danger to a pregnant woman's life, as illegal in India and prescribed a punishment of 3 years for the offence.
 - **Medical Termination of Pregnancy (MTP) Act, 1971** overrides the section 312 of IPC. Key Provisions include (after 2021 amendment):
 - For pregnancies upto 20 weeks, termination is allowed under the opinion of one registered medical practitioner if:
 - A. The continuance of the pregnancy would involve a risk to the life of the pregnant woman or of grave injury to her physical or mental health; or
 - B. There is a substantial risk that if the child was born, it would suffer from any serious physical or mental abnormalities.
 - The 2021 amendment replaced the term 'married woman and her husband' with the term 'woman and her partner'. Hence now unmarried women can also terminate her pregnancies within gestational limits under the act.
 - The explanation to the provision states that termination within 20 weeks is allowed if the pregnancy was caused by failure of contraceptive which was used for limiting the number of children or for preventing pregnancy. The anguish caused by such unwanted pregnancy may be presumed to constitute a grave injury to the mental health of the pregnant women.
 - For pregnancies between 20-24 weeks, the Rules attached to the law prescribe certain criteria in terms of who can avail termination. It also requires opinion of two registered practitioner in this case.
 - **Medical Termination of Pregnancy (Amendment) Rules, 2021** notified in Oct 2021.
 - The gestation limit for termination of a pregnancy in India has been increased from 20 to 24 weeks for some categories of women.

- **Section 3B of the Rules** list seven categories which include survivors of rape/incest; minors; change in marital status during the ongoing pregnancy (widowhood, divorce); women with physical disabilities (major disabilities as per the criterias of PwD Act, 2016); Mentally ill women; cases of foetal malformation; women with pregnancy in humanitarian settings or disaster or emergency situation as may be declared by the government.
- Abortion beyond 24 weeks is allowed only in cases of substantial foetal abnormalities diagnosed by a medical board.
All states/UT governments will constitute a **medical board** consisting of gynecologist, pediatrician, radiologist/sonologist and other members notified by the state government.
- Abortion at any stage will be allowed if needed immediately to save women's life. Here only opinion of one registered medical practitioner would be needed.
- **Protection of Privacy:** Name or other details of a woman whose pregnancy has been terminated shall not be revealed except to a person authorized in any law for the time being in force. Violation of this privacy norm is punishable with imprisonment up to a year, a fine or both.

- **Global Scenario:**

- Globally there has been a trend towards liberalization of abortion laws and increased access to abortion services.
- Since the early 1990s, nearly 60 countries across the world eased abortion laws to expand the grounds under which abortion is legal.
- Only four countries, namely El Salvador, Nicargua, USA and Poland have removed legal grounds for abortion during this time. Most notably, the US Supreme Court eliminated the constitutional right to abortion in 2022.

- **Problems that still remain:**

- Despite various laudable steps, the law didn't go far enough to change the landscape of abortion rights in India:
 - Experts believed that extension of abortion permission till 24 weeks should be for all women rather than a few categories.
 - **Women still hasn't been given complete control over her body** - Over the years, the understanding and appreciation of the need for women to have complete control over their bodies has increased. This is evident from various Supreme Court verdicts (e.g. the Puttaswamy Judgment) and International Conventions (e.g. the Convention on Elimination of All Forms of Discrimination against women). But, the amendment still leaves the decision of termination in the hands of doctors.
 - **Various SC verdicts** had supported this argument:
 - In '**Suchita Srivastava vs Union of India**' case, the SC held that a women's right to make reproductive choices is also a dimension of personal liberty guaranteed under Article 21 of the Constitution.
 - In '**Puttaswamy verdict**' the court held that a women's constitutional right to make reproductive choices and the right to "abstain from"

procreating" was read into the right to privacy, dignity and bodily autonomy.

- Allowing termination of pregnancy beyond 24 weeks in case of only "foetal abnormalities" would mean that a woman would still need to file a writ petition before the court if she wishes to undergo termination for a reason other than the existence of "foetal abnormalities".
 - Similarly, in case of "sex workers", having a provision for "partner" in the framework for abortion, would be a challenge.
 - Finally, very restrictive laws, promote backstreet abortions/ illegal abortions or leads to abandonment of child.
- Some operational issues:
- Accountability of the medical practitioners and hospitals for providing the sanction needed for abortions. There is no onus on the doctors to respond within a clearly specified timeframe, preferably in matters of hours.
 - The law also doesn't deal with situations where the two doctors are of contrasting opinion.
- POCO and MTP contradictions
- MTP requires doctors to protect confidentiality of person getting abortion, whereas POCO and the CrPC require mandatory reporting of sexual offences against children.

A) SUPREME COURT VERDICT: X V NCT (SEP 2022)

- Background:
 - Provision 3B of the Medical Termination of Pregnancy Rules, 2003 allowed only some categories of women to seek termination of pregnancy between 20-24 weeks under certain extra ordinary categories.
 - The Challenge to the provision was made in July 2022 when a 25 year old unmarried woman who moved the court seeking an abortion after Delhi High Court declined her plea to terminate pregnancy in the 24th week. The woman's case was that she wished to terminate her pregnancy as "her partner had refused to marry her at the last stage". She also argued that continuation of pregnancy would involve a risk of grave and immense injury to her mental health.
 - However, the law allowed such change in circumstances only for "married" relationships.
 - The Supreme Court, holding that the law had to be given a purposive interpretation, had allowed the petitioner to terminate her pregnancy in an interim order. However, the larger challenge to the law, which would benefit other women as well, was kept pending.
- Key Highlights and significance of the verdict:

- The Court held that "the distinction between married and unmarried women under the abortion law through its rules is "artificial and constitutionally unsustainable"" and perpetuates the stereotype that only married women are sexually active.
 - Rights available to married women under Medical Termination of Pregnancy Act, 1971, to abort foetus will be available to all women (married or in consensual relationships, and including "persons other than cis-gender women").
- The court also expanded on Rule 3B(a) - "Survivors of sexual assault or rape or incest" - to include married women in its ambit. Although it doesn't have the effect of striking down the marital rape exception under the IPC, the ruling said that the women who have suffered "marital assault" can be included in the provision. It is not inconceivable that married women become pregnant as a result of their husbands having "raped" them.
- Clarification on POCO vs Right to Privacy norms:
 - The court acknowledged that adolescent girls who have indulged in consensual sex and are seeking abortion face problems while accessing safe and legal MTP due to provision of mandatory reporting to the police under the POCO. The judgment clarified that while the need to report mandatorily remains, the identity of the pregnant person need not be disclosed in the cases of consensual sexual activity and where the minor and/or her guardian request the medical service provider to maintain confidentiality.
- Constitutional values, such as the right to reproductive autonomy, the right to live a dignified life, the right to equality, and the right to privacy has led court to reinterpret the contours of the MTP Act and the MTP rules.
 - The ruling "recognizes" the right of unmarried women; expands and enlarges women's reproductive right.
 - The Court said "Article 21 of the Constitution "recognises and protects the right of a woman to undergo termination of pregnancy if her mental or physical health is at stake. Importantly, it is the woman alone who has the right over her body and is the ultimate decision-maker on the question of whether she wants to undergo an abortion... Depriving women of autonomy not only over their bodies but also over their lives would be an affront to their dignity"
 - While recognizing right to equality, the court also said that her agency and choice is equally important.
- The apex Court has thus created a progressive jurisprudence which interprets the law from the point of view of rights of persons accessing the services.
 - The verdict interprets the provisions of the law/rules as per the changing social mores.
 - The verdict said "transformative constitutionalism promotes and engenders societal change by ensuring that every individual is capable of enjoying the life and liberties guaranteed under the Constitution" and "the law must remain cognizant of the fact that changes in society have ushered in significant changes in family structures"
- The judgement also makes Indian legal system in compliance with international norms which obligates India to provide safe and legal access to sexual and reproductive health and rights that include abortions.

- Report by UN population Fund in 2022 - nearly 67% of abortions in India are deemed unsafe killing eight women on an average daily.

B) SUPREME COURT VERDICT (OCT 2023): REJECTED A 26-WEEK PREGNANT WOMEN'S PLEA FOR ABORTION:

- A married woman 26 weeks pregnant had approached the SC seeking to terminate her pregnancy citing inability to take care of the child due to post-partum depression and other health issues. She has two other children and the new pregnancy had gone undetected due to lactational amenorrhea. Her last pregnancy was an year ago and she is being treated for postpartum psychosis.
- The Supreme Court rejected the woman's plea for abortion.
- **Reasons why court denied the request:**
 - The AIIMS medical board in its report found no cause for immediate concern: the foetus was healthy and viable.
 - The court also added government would bear the cost and woman may give the child for adoption post delivery.
 - It said that there are rights of unborn child too and it should be balanced.
- **Analysis:**
 - **Rights of women vs Foetal Rights**
 - While in X v NCT the court declared that 'it is woman alone who has the right over her body' and is the ultimate decision maker. However, in practice, when individual women come before courts, a discourse on foetal rights has begun to emerge.
 - **Pro-Life and Pro-choice debate:**
 - This conversation is largely alien to India. But now, court has initiated this debate and thus it has to be engaged with.
 - A pro-choice discourse however, is not materially and politically conducive argument for Indian Society.
- **Way Forward:** Apex Court's decision (Sep, 2022) is only the first step forward in the Indian women's fight for reproductive and bodily autonomy. Much more needs to be done:
 - The true measure of the success of the amendment and the 2022 SC judgment would be its effective implementation and how it is able to bridge the access gaps.
 - Focus on increasing access - increase the number of gynaecologists and obstetricians in community health clinics in rural areas.
 - Take strict action against illegal abortion clinics.
 - Put in place a rights-based approach, telemedicine etc.
 - Bring clarity on the "Rights of a foetus"

- The rights of foetus under the Indian Constitution is unclear - there is no upfront articulation about it. Whether the foetus possesses rights, or simply interests is also ambiguous.
 - A 2016 Bombay High Court decision relied on international human rights law to hold that the foetus doesn't have rights till birth.
- **In essence**, the state of law is jumbled, and requires urgent deliberation, especially if foetal interests (or, rights) are being used to restrict abortion rights.
- **Make the wording of the law more inclusive by replacing "Women" with "Person".**
 - Many people who don't identify as women but can experience pregnancy. They also require access to safe abortions.
- **Some other amendments** which could further make MTP progressive include:
 - Allowing abortion upto 12 weeks at the will of the pregnant women.
 - Extending the option of abortion beyond 24 weeks to survivors of sexual abuse/rape.
- **Increased Awareness** about the law and the SC Verdict:
 - This is needed as abortion still remains a stigma, especially in the lower rungs of society with motherhood constantly being looked through a moral prism.
- **Mainstream medical curriculum** as well as **Society** -> needs to be sensitized towards women's right and their freedom of choice to either keep or terminate her pregnancy, which would ultimately affect her entire life by interrupting her education, her career, or affecting her mental health.

2. GENERAL STUDIES-3

1) S&T: FUSION REACTIONS:

- **Why in news?**
 - US scientists repeat fusion ignition breakthrough for 2nd time in July 2023.
 - Scientists at the California-based lab repeated the fusion ignition breakthrough in an experiment in the National Ignition Facility (NIF) on July 30 that produced a higher energy yield than in December.
- **Example Questions:**
 - "Use of fusion process for generating electricity at a commercial scale is decades away, but the latest experiment by US scientists is still a big deal. Elaborate. How is their method different from the one being used by ITER?"
- **Introduction:**
 - **Fusion** is the energy source of the Sun and Stars. A fusion reaction occurs when two atoms of lighter nuclei combine to form an atom with heavier nucleus. The mass of the resulting atom is slightly less than the combined mass of the constituent atoms, and this lost mass is released in the form of energy as per Einstein's mass-energy equivalence relation ($E=mc^2$)
 - **Fusion takes place** at very high temperature (for e.g. Sun's core has a temperature of 15 million degree C)
 - What is the **need of extremely high temperature?**
 - » to **overcome the electrical repulsive force**
 - Till date we don't have any stable fusion reactor.
 - **Development of thermonuclear energy power plants has been difficult:**
 - **Three conditions must be fulfilled** to achieve fusion in a laboratory:
 - » **Very High Temperature** (on the order of 15 million degrees C)
 - » **Sufficient Plasma particle density** (to increase the likelihood that collisions do occur)
 - » **Sufficient confinement time** (to hold the plasma, which has the propensity to expand, within a defined volume)
 - **Note:** Twentieth century fusion science identified the most efficient fusion reaction in the laboratory setting to be reaction between two hydrogen isotopes, deuterium (D) and tritium (T), as the D-T reaction produces the higher energy gain at the "lowest temperatures".
- **Why nuclear fusions are important as an energy source?**
 - **Easily available raw material**
 - **Most efficient known form of energy production** in the universe – it produces four times more energy than a standard Uranium-based fission reaction.

- Nuclear Fusion is a clean and green route to produce energy, as it doesn't involve any remnant waste products.
- Long term energy security

- **USA's Attempt:**

- In Dec 2022, an experiment at US National Ignition Facility (NIF), within the Livermore National Laboratory, Livermore, California, achieved a **fusion ignition** by successfully conducting a fusion test that produced 153% (1.53 gain) as much energy as went into triggering it.
- In July 2023, in a repeat of the above experiment, scientists were able to generate more energy with nearly a **factor of 2 in gain** compared with energy of the incoming lasers.

- **Types of Fusion Reactions:**

- **What happens in Sun's Core?**
 - Class discussion
- For fusion reaction to happen in reactors, the high temperature must be created artificially. There are two different ways of achieving this: **Inertial Confinement Method** and **Magnetic Confinement Method**:
 - 1) **Inertial Confinement Method:** In this method, high energy laser beams are focused onto a pellet of the fuel (D-T), which creates extreme temperatures required for fusion inside it. The outer mass of the pellet explodes and is responsible for confining the reaction.
 - E.g., **The NIF reactions**
 - 2) **Magnetic Confinement Fusion (MCF):** It uses a magnetic field to contain plasma, which prevents the particles from hitting the reactor walls which could otherwise cause them to slow down.
 - **Magnetic confinement** uses a torus-shaped reactor called tokamak, in which a hydrogen plasma is heated to a high temperature and the nuclei are guided by strong magnetic fields to fuse. **ITER** is a famous example of an experiment trying to achieve fusion using magnetic confinement.
 - 3) **Some other variants** also exist such as those which use a combination of these methods (Magnetized Target Fusion) and those that combine fission with fusion (Hybrid Fusion)

- **The NIF Breakthrough:**

- » In Dec 2022, NIF was finally able to achieve 'breakeven', or a **net positive energy gain**.
- » In July 2023, it was able to replicate its efforts, but now with a bigger gain (almost 2)
- » In both these achievements **inertial confinement was employed**.

- In NIF's set up, high-power lasers fire pulses at a 2 mm wide capsule inside a 1-cm-long cylinder called **hohlraum**, in less than 10 billionths of a second. The capsule holds deuterium and tritium atoms.
- As the pulse strikes the hohlraum's inside, the latter heats up and releases x-rays, which heat the nuclei to millions of degrees centigrade and compress them to billions of Earth atmosphere. This technique is called inertial confinement method because the nuclei's inertia creates a short window between implosion and explosion in which the strong nuclear force dominates, fusing the nuclei.
- Specifically, when two hydrogen-2 nuclei fuse, they yield a helium-4 nucleus, a neutron and **17.6 MeV** of energy.

- **Significance:**
 - » Fusion ignition is one of the most impressive feats of the 21st century and is an engineering marvel beyond belief.

- **Some Caveats:**
 - » **First:** NIF experiment is highly sophisticated and required very high precision. Even small changes in the experiment may negatively impact the output. So, for long term use, **they will have to reproduce these results again and again.**
 - » **Second:** For fusion reaction to be truly gainful, the **energy released by the reactions needs to be greater than the energy going into the lasers**, about 300 megajoules, and not just the energy delivered to the hohlraum. This hasn't been achieved yet. The energy transferred to plasma is just 1%, the rest is all lost in other processes. **"Future research will need to focus on reaching the next major milestone – a target gain of G > 100, which is required to run a power plant efficiently.**
 - » **Third:** The **road to a power plant from the NIF's current achievement isn't well understood.**

- **India and Fusion:**
 - India has become one of the major players in fusion technology and has been one of the pioneers in its development.
 - The **Plasma Physics Program** was initiated by the GoI in 1982 to conduct research at MCF, which later evolved into the **Institute for Plasma Research (IPR)** in 1986 and led to the creation of India's own **tokamak, ADITYA**, in 1989.
 - Subsequently, it also developed a large semi-indigenous tokamak called the **Steady State Superconducting Tokamak (SST-1)** which was fully commissioned in 2013. IPR has also revealed its plans for a **successor**, the SST-2, due in 2017.
 - In 2005, India became the 7th member to join the **International Thermonuclear Experiment Reactor (ITER) project**, a global initiative attempting to build the world's largest tokamak reactor.
 - **ITER-India** has been set up under the supervision of IPR and is responsible for fulfilling India's commitment to the project. It has already provided the **world's largest cryostat**, a vacuum application stainless steel vessel, to house the reactor, along with a host of other equipment.

- **Key Limitations for India:**
 - Lack of **Private Investment**: it is primarily because of **Atomic Energy Act, 1962**, which puts the brunt of developing and running nuclear power stations on the government.
 - **However**, a recent government panel convened by NITI aayog has recommended overturning the ban of foreign investment and allowing greater participation of private players.
- **Conclusion:** The NIF experiment has opened up a new avenue for achieving nuclear fusion through the means of inertial confinement and it would be fruitful for India to take notice and invest in this technology since it's clear that this is where the future lies.

2) NON-PERFORMING ASSETS (NPAS)

- **Non-Performing Assets - Basics**
 - » Assets in a banking system comprises of loans given and investments (in bonds etc.) made by banks as these earn interest/profit for banks.
 - » If the interest/ principal instalment of a loan is not paid until due date, it is called **bad loan**.
 - » An asset including a leased asset, becomes non-performing when it ceases to generate income for the bank.
 - » According to RBI **A Non-Performing Asset** is a loan or advance where instalment/interest is due for more than 90 days in case of a term loan or overdraft account/ credit account. Similarly in case of **agriculture loans** an account becomes an NPA if the instalment/interest remains overdue for two crop season for a short duration crop, or one crop season for a long duration crop.
- **Stressed Assets** refers to all NPAs plus restructured assets plus written off assets.
- **NPAs of Indian Banking System had reached 11.18% in 2018.**
- **Why had NPAs increased so much in the last decade?**
 - I. **Credit Boom in mid 2000s and then the global financial crisis:** In Mid 2000s large corporates were granted loans based on extrapolation of their recent growth and performance. But with stagnating economic growth due to Global financial crisis, their loan returning capabilities decreased.
 - II. **Indian creditors used the strategy of "Giving time to time" and hoped that economic revival will reduce NPAs -> this only led to evergreening of NPAs.**
 - III. **Poor Recognition:** Banks were initially reluctant to recognize NPAs. The true extent of NPA problem only started becoming clear once the RBI initiated the Asset Quality Review in 2015.
 - IV. **Poor Governance and Regulation of Banks - Crony Capitalism - Poor Recovery**
 - V. **Lack of specialization of banks in recovering bad loans / NPAs**
 - VI. **Other Factors which negatively impacted businesses**
 - **Key Judicial Decisions**
 - Judicial decisions like abrupt cancellation of coal mines and spectrum allocation led to reallocation through expensive auctioning procedure and thus proved to be a fatal burden on respective business models of power, steel and telecom.

- **Land Acquisition and environmental clearance issues** also blocked a number of projects and contributed towards increasing NPAs.

VII. **Insolvency and Bankruptcy Procedure** has not proved very effective yet.

VIII. **Absence of strict action against bank frauds of high magnitude**

- This is because of absence of a strong law against wilful defaulters and fraudsters

– **IMPACT Of High NPAs**

» **On Banking Sector**

- Decreasing income/Increasing losses for the banks
- Reduces effective internal source of increasing capital which is even under a lot of pressure on account of impeding BASEL-3 guidelines.
- Downgrading of ratings as asset quality deteriorates, this would make international operation and funding difficult.

» **Hinders Economic Growth**

- Accumulation of NPAs in the banking system, specifically in the PSBs, had adverse effects on credit disbursement. Reduction in credit available for market and individual customers led to slowing down of economy.
- The Rise in NPAs occurred with the deterioration of the balance sheet of non-financial firms, and this **twin balance sheet problem** contributed significantly to the deceleration of growth in late 2000s.

» **On Government**

- Increasing **fiscal burden** on government as it has to recapitalize these banks to ensure their proper functioning.

» **On Individuals/ Society**

- **Relatively expensive loans** and decreased interest on deposits.
 - This means that performing borrowers and depositors were effectively being taxed in order to subsidize the non-performing borrowers.
 - Only after demonetization, the interest rates went down because of the flux of cash with the banks
- Less budget/credit available for social welfare programs.
- Eventually its common man's money in the form of deposits which have been lend by banks and is put at risk in case the bank fails.

– **Balance Sheet Syndrome with Indian Characteristics:** High NPAs (TBS problem) have derailed growth in other countries. But huge NPAs have not had as huge an impact as in case of other countries. This is being considered 'Balance Sheet Syndrome with Indian Characteristics.'

- This is because the NPA's are concentrated in public sector banks which not only hold their own capital but are ultimately backed by the government who would eventually come to save these banks in case situation gets out of hand. Therefore, creditors have retained confidence in the banking system and there has been no bank runs, no stress in the inter-bank market etc.
- Mid 2000s boom had created enough infrastructure (in India's severe supply constraint economy), that there was ample room for the economy to grow after the GFC.

- **4 Key steps in solving the NPA problem** (As suggested by Economic Survey of India 2015-16)
 - o **4Rs, Recognition, Recapitalization, Resolution, Reform**
 - » **Recognition:** Banks must value their assets as far as possible close to true value (recognition) as the RBI has been emphasizing
 - Asset Quality Review by RBI has done this and brought the real numbers forward.
 - » **Recapitalization:** Once the true value of the assets is recognized, the capital position must be safeguarded via infusion of equity (recapitalization).
 - Bank recapitalization has been a regular feature of the Union Budget since 2016-17. Between FY17 and FY21, the centre has infused about 3.31 lakh crore into banks.
 - » **Resolution:** The underlying stressed assets in the corporate sector must be sold or rehabilitated (resolution) as the government has been desiring.
 - IBC has played an important role in increasing recovery.
 - » **Reform:** Future incentives for private sector and corporates must be set-right to avoid repetition of the problem.
 - Reform is one area where least progress has been made.
 - Governance structure of the banks have almost remained the same

- **Steps Taken:**

1. **Know your customer (KYC)** norms have been strengthened
2. **Early identification and reporting of stress** - Special Mention Account (As per revised framework for resolution of stressed assets - Feb 2018)
 - Lenders are required to identify incipient stress in loan accounts, immediately on default, by classifying assets as Special Mention Account (SMA) as per the following categories

SMA Subcategory	Basis for classification - principal or interest payment or any other amount wholly or partly overdue
SMA-0	1-30 days
SMA-1	31-60 days
SMA-2	61-90 days

 - This has to be reported to Central Repository of Information on Large Credit (CRILC) on all borrowers' entities having aggregate exposure of Rs 5 crore and above with them.
3. **Asset Quality Review by RBI**
 - To deal with the cases of divergences in identification of NPAs or addition provisioning across banks at the central office level
4. **Indradhanush Scheme**
 - Improving 7 different areas of banks (including capitalization)
5. **Insolvency and Bankruptcy Code (IBC-2016)**
 - To fast track insolvency resolution process and increase the % recovery. This was a more direct path to handle bad loan.
 - It allowed lenders to take defaulting borrowers to NCLT and trigger off bankruptcy proceedings against them.

6. **Fugitive Economic Offenders Act, 2018**, is also acting as a deterrent and may prevent future offenders from running to other countries.

7. Project Sashakt (July 2018)

- It is a five pronged strategy to resolve bad loans outline - SME resolution approach, bank led resolution approach, AMC/AIF led resolution approach, NCLT/IBC approach and asset trading platform
 1. **SME Resolution Approach (SRA):** Bad loans of upto 50 crore will be resolved at the bank level, with a deadline of 90 days. For this approach, the committee has also suggested setting up of a steering committee by banks for formulating and validating the schemes, with a provision for additional funds.
 2. **Bank led resolution approach:** For loans between 50-500 crore, banks will enter an inter-creditor agreement, authorizing the lead bank to implement a resolution plan in 180 days, or refer the asset to NCLT. Here, an independent steering committee appointed by the Indian Banks Association (IBA) will validate the process. The resolution plan has to be approved by lenders holding at least 66% of the debt.
 3. **AMC/AIF led resolution approach:** For loans above 500 crore, the panel envisages one or more Independent Asset Management Company (AMC), supported by institutional funding through the Alternate Investment Fund (AIF).
 - The committee suggested that the bidding process should follow a market-led approach, inviting bids from AMCs, ARCs, and AIF.
 - Existing players, such as ARCL and the national AMC, will be allowed to set the floor price for the bad assets while other players will be asked to either match the price or better it.
 - The AMC has to redeem security issued to banks by ARCs within 60 day
 4. **Asset trading platform** for performing and non-performing loans
 5. **NCLT/IBC approach**
 - If none of the above approaches work, NCLT will take over under the IBC provisions.

8. Prompt Corrective Action (PCA) Framework

- **What is PCA?**
 - It is a framework under which banks with weak financial matrices are put under watch by RBI.
 - The framework uses **three parameters** to measure the weakness of a bank:
 - **Capital Ratio**
 - **Asset Quality**
 - **Profitability**
- **RBI's revised PCA framework for banks applicable from 1st Jan 2022.**
 - The framework would apply on all banks operating in India, including foreign banks operating through branches or subsidiaries based on breach of risk thresholds of identified indicators.
 - **Three parameters** to measure the weakness of the bank: Capital, Asset Quality and Leverage Ratio.

- **Indicators to be tracked** for capital, asset quality and leverage would be CRAR/Common Equity Tier-1 Ratio, Net NPA Ratio, and Tier 1 Leverage Ratio.
- **Breach** of any risk threshold may result in invocation the PCA.
- **Entry:** A bank will generally be placed under PCA framework based on the Audited Annual Financial Results and the ongoing Supervisory Assessment made by RBI.

PCA matrix – Parameters, indicators and risk thresholds

Parameter (1)	Indicator (2)	Risk Threshold 1 (3)	Risk Threshold 2 (4)	Risk Threshold 3 (5)
Capital (Breach of either CRAR or CET 1 ratio)	CRAR - Minimum regulatory prescription for Capital to Risk Assets Ratio + applicable Capital Conservation Buffer (CCB) and/or Regulatory Pre-Specified Trigger of Common Equity Tier 1 Ratio (CET 1 PST) + applicable Capital Conservation Buffer (CCB) Breach of either CRAR or CET 1 ratio to trigger PCA	Upto 250 bps below the Indicator prescribed at column (2) Upto 162.50 bps below the Indicator prescribed at column (2)	More than 250 bps but not exceeding 400 bps below the Indicator prescribed at column (2) More than 162.50 bps below but not exceeding 312.50 bps below the Indicator prescribed at column (2)	In excess of 400 bps below the Indicator prescribed at column (2) In excess of 312.50 bps below the Indicator prescribed at column (2)
Asset Quality	Net Non-Performing Advances (NNPA) ratio	>=6.0% but <9.0%	>=9.0% but < 12.0%	>=12.0%
Leverage	Regulatory minimum Tier 1 Leverage Ratio	Upto 50 bps below the regulatory minimum	More than 50 bps but not exceeding 100 bps below the regulatory minimum	More than 100 bps below the regulatory minimum

- **RBI's corrective action plan based on risk threshold**
 - RBI can put **mandatory restrictions** on dividend distribution, branch expansion, and management compensation based on the risk threshold.
 - In an extreme situation, breach of third threshold, would identify bank as likely candidate for resolution through amalgamation, reconstruction or winding up.
 - Further there can be **discretionary restrictions** on bank's lending limit, special audit etc.
 - RBI can supersede the bank's board, under the PCA.
- **Idea behind PCA:**
 - Handle problems before they attain crisis situation.
 - Essentially PCA helps RBI monitor key performance indicators of banks, and taking corrective measures, to restore financial health of a bank.

9. UDAY Scheme (for state power discoms)

- As they were one of the largest NPA holders.

10. Governance Reform in banks

- E.g., Separation of the post of CMD and Chairman

- Impact: Current Situation:

- » Since 2015-16, RBI and the government have made dedicated efforts in terms of calibrated measures like strengthening the regulatory and supervisory framework, implementation of 4R's

approach of **Recognition, Resolution, Recapitalization, and Reforms** to clean and strengthen the balance sheet of the banking system. These continuous efforts have culminated in the enhancement of risk absorption capacity and a healthier banking system balance sheet in terms of asset quantity and quality over the years.

- » **Indian Banks' NPA has fallen to a 10-year low and is expected to improve further: RBI**
 - Gross NPAs of Indian Banks is 3.9% as of March 2023.
 - Net NPAs had dropped to a ten year low of 1.3% in Sep 2022.
- » **Why decrease:**
 - Lower slippages and reduction in outstanding GNPAs through recoveries, upgrades, and write offs led to this decrease.

- **What more can be done:**

- » **Governance Reform in Banks and exit of poorly performing banks.**
 - Financial sector is undergoing structural changes (fintech and other NBFCs) are challenging existing business models.
 - Governance reforms and cost reduction through innovation should be the key to survive in this environment and therefore it is important that inefficient banks should be wind up.
 - Banks have to come up with robust credit worthiness evaluation mechanism.
 - Process of consolidation of banking sector should continue.
- » **Strengthening Insolvency and Bankruptcy Code** as and when loopholes emerge
 - Currently NCLT faces huge work load and hence its resources needs improvement.
- » **Bring back developmental financial institutions.**
- » **Robust and Transparent Secondary market** should be promoted to deal with bad loans.
 - For e.g., in USA, almost a trillion dollar of bad debt is handled every year through an active secondary market which includes ARCs.
 - A robust and transparent secondary market, unhindered by excessive regulation, is an essential element in the vital process of transferring risk from the banks to the capital markets.
- » **Strengthening legal system** to deal with willful defaulters.
 - Currently, willful defaulters are mostly able to go scot free. This will inculcate discipline among the borrowers.

- **Conclusion**

- » Though NPA issue has been resolved, but if the core issues of the banking sector like poor governance, political interference, etc are not resolved, the problem may re-emerge in future.

3. PRELIMS FACTS

1) PLACES IN NEWS: GULF OF GUINEA

It is the north easternmost part of the tropical Atlantic Ocean from Cape Lopez in Gabon, north and west to Cape Palmas in Liberia.

The intersection of Equator and Prime Meridian (Zero degree longitude and Zero degree latitude) is in the gulf.

It borders eight African countries - Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Gabon, Sao Tome & Principe.

Note: Some definitions of Gulf of Guinea also include Cote d'Ivoire and Liberia as the border countries of Gulf of Guinea.

River: the main river dispersing its water in the Gulf are the Niger River and the Volta river.

Note: Volta is the main river system in the country of Ghana.

In Oct 2023, India conducted joint drills with warships from the EU in Gulf of Guinea, including flying exercises and tactical manoeuvres off the coast of Ghana.

This is the **first time** Indian ships have taken part in such a drill in the Gulf of Guinea with EU.

Indian Navy's INS Sumedha, an offshore patrol vessel, was joined by naval ships of three EU member states - Italian ship ITS Foscari, French Ship FS Ventose and Spanish Ship Tornado



Earlier, in Sep 2022, INS Tarkash, which is deployed in Gulf of Guinea for anti-piracy operations took part in joint maritime exercise with Nigeria Navy Patrol Ships. This exercise marked the first joint operational deployment by India and Nigeria, in support of anti-piracy operations, in the Gulf of Guinea.



CURRENT AFFAIRS PROGRAM

PRE-CUM-MAINS 2024

NOV 2023: BOOKLET-1

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1) SOCIAL JUSTICE: THE QUESTION OF SAME SEX MARRIAGE

- Background:

» In Navtej Singh Johar case, Supreme Court decriminalized homosexuality. But gay marriages still didn't have legal recognition in India. In a landmark case, a group of 18 same-sex Indian couples had petitioned the country's Supreme Court to legalize same-sex marriage.

- **Key Demands:** The petitioners had sought a ruling by which the Special Marriage Act (SMA), 1954, which provides for a civil marriage for couples who can't marry under the personal law, should be interpreted as gender neutral, thus allowing the same sex marriage. The current interpretation of SMA, they argued violates Articles 14, 15, 19, 21 and 25 by not allowing marriage between same-sex, gender non-conforming, LGBTQIA+ couples, and sought the words "husband" and "wife" as well as any other gender-specific term to be substituted by the word "party" or "spouse".
- The petitions argued that marriage brings with it several rights, privileges, and obligations that are "bestowed and protected by law".
- The Delhi Commission for Protection of Child Rights (DCPCR) also advocated for recognition of marriage, filing an intervention application to assist the court on the impact of such marriages on children.

» Respondents Opposing the petition:

- The Central Government, the National Commission for the Protection of Child Rights, and a body of Islamic Scholars called the Jamiat-Ulama-i-Hind, opposed the petitions.

- Argument Supporting Same Sex Marriage

» Protecting the Fundamental Rights of Every Citizen:

- The right to marry for non-heterosexual couple is implicit in Article 14 (Equality), 15 (Non-Discrimination), 16 (Equality of Opportunities in public employment), 19 (Freedom of Speech), and 21 (Right to Life). This is specially true after the SC ruling in 'Navtej Singh Johar vs. Union of India' and 'KS Puttaswamy verdict'.
- In Navtej Singh Johar verdict, Justice Chandrachud held that members of LGBT community are entitled, as all citizens, to a full range of constitutional rights, including liberties protected by the Constitution.

» Ensuring other benefits of marriage to homosexuals:

- Being able to marry a partner would allow homosexuals to a host of rights currently reserved for heterosexual married couples - including right to jointly adopt children, own property together or nominate one another as a surrogate decision maker in a medical emergency, right to inheritance, maintenance and tax benefits.

- » Since Navtej Singh Johar Judgment, several high court verdicts have ruled in favor of same sex couples having the right to live together.
 - In **Madhu Bala vs State of Uttarakhand (2020)**, the high court of Uttarakhand held that right of a same sex couple to live together is a constitutional and human right.
 - In **Vanitaben Damjibhai Solanki vs State of Gujarat (2020)**, the Gujarat High Court ordered police protection for two women police constables in a relationship.
 - In **S Sushma v Commissioner of Police (2021)**, the court protects the couple in relationship and makes sure that both sets of parents are taken along in this journey.
- Legal recognition of same sex marriage will contribute to society's acceptance towards homosexuality.
- A study titled 'The Anticipated Impact of LGBTQIA+ Marriage Equality Legislation on Indian Society and Mental Health' among Indians has found that legalization of such unions will have a "positive impact on mental health of LGBTQIA+ individuals".
- There are around 30 countries where same sex marriage is legalized. These countries have seen no harm to their culture and no deterioration of the legitimacy of traditional marriage in any place where same sex marriage is lawful.
- Arguments of people opposing same sex marriage:
 - They argue that same sex marriage is afront to Indian customs and is an urban elitist concept.
 - The government also argued that if Supreme court legalizes same sex marriage, it will mean a virtual judicial rewriting of an entire branch of law and court must refrain from passing such omnibus orders. Proper authority for this should be the legislature.
 - Some don't consider it as normal because they can't replicate babies.
- Supreme Court Verdict: **Supriyo a.k.a Supriya Chakroborty & Abhay Dang v. Union of India** (Oct 2023)
 - The Supreme Court declined to legalize same sex marriage, leaving it on the Parliament to legislate on the subject.
 - In fact, all five judges agreed that there is no fundamental right to Marry under this Indian Constitution.
- Key highlights of the majority verdict (3:2):
 - There is no fundamental right to marry in the Constitution, and the court can't intervene.
 - » "An institution can't be elevated to the realm of fundamental right based on the content accorded to it by law".
 - Legal recognition of the right to a Civil Union - akin to marriage or civil union - can only be through enacted law.
 - Courts can't enjoin or direct the creation of a legal or regulatory framework resulting in the conferment of legal status on same-sex couples, **nor the same sex couples be granted the right to adopt**.

- The Court cannot read words into the provisions of the SMA and provisions of other allied laws such as the Indian Succession Act and the Hindu Succession Act because that would amount to Judicial legislation.
 - » The provisions and objectives of the SMA clearly points to the circumstances that Parliament intended only one kind of couples, i.e., heterosexual couples belonging to different faiths, to be given the facility of civil marriage.
 - » The court in the exercise of power of judicial review must steer clear of matters, particularly those impinging on policy, which fall in the legislative domain.
 - Despite the above, separate directions have been issued to the Union of India for setting up a high-level committee (under the chairmanship of cabinet secretary) to help ameliorate the manifold difficulties (including discrimination) experienced by the same sex couples living together.
- The **minority opinion**, of CJI D.Y. Chandrachud and Justice Sanjay Kishan Kaul, said the LGBTQIA+ community had a fundamental right to form relationships and that the state was obligated to recognize and grant legal status to such unions, so that the same sex couple could avail the material benefits provided under the law and also could adopt kids. But they also declined to read down the provisions of the SMA to that effect.
- **Analysis: Positives of the Judgment:**
- » **The verdict respects Constitutional Morality:** Separation of Power is one of the basic features of the constitution and judicial legislation would have violated it.
 - Under India's Constitution the power to make laws - including laws related to marriage - vest exclusively either with Parliament at the Centre or with a state legislature in a state - by reason for provisions contained in Article 245(1) and Article 246(2) of the Constitution read along with Item 5 in the Concurrent List.
 - » **To bestow legal recognition to homosexual marriages would need amendment to several laws,** which is the domain of people's elected representatives, not a few selected jurists.
- **Analysis: Limitations:**
- » **Right to marry is a human right as per Universal Declaration of Human Rights (UDHR)** of which India is an original signatory.
 - **Article 16 of the UDHR, 1948** provides that, "Men and women of full age, without any limitations due to race, nationality, or religion, have the right to marry and to form a family.
 - Since Right to Marry is a human right, it should also be recognized as a fundamental right.
 - SC in the past have relied on UDHR to interpret provisions of Fundamental Rights in India.
 - For e.g., in the Maneka Gandhi case, the SC relied on Article 10 of the UDHR to read in principles of natural justice in the administrative process to state.
 - » The Constitution has given the task of defending the fundamental rights of all citizens to the Supreme Court and Supreme court has in the past struck laws which are violative of fundamental rights. If a law is providing legal protection to some citizens and not covering other

citizens, it is definitely **violating Article 14 of the Constitution** and it should be in the mandate of the Supreme Court to amend it.

- The judgement will prolong the long and arduous struggle to create the conditions where same sex couples could live a life without fear, in the sweet elixir of freedom and equality.

» **Social Morality/ Majoritarian Morality** has been given more importance than Constitutional Morality.

- In Navtej (2018), Justice Chandrachud had held that "the Court has to be guided by the conception of constitutional morality and not by the societal morality. In the garb of social morality, the members of the LGBT community must not be outlawed or given a step-motherly treatment of malefactor by the society".
- » **Negative social implications for LGBT community:** The unintended consequence of the judgement in the larger society is that the notion that the same sex couples are "not fit for marriage" will be perpetuated.

- **Way Forward:**

- **Consistent Efforts by LGBT community and other human rights group to get legal recognition:**
 - » Government was against same sex marriage in the SC and thus there are less chances that it would come up with amendments to recognize same sex marriage at its own.
 - » The LGBT community, and human rights group will have to work on several fronts to increase the social acceptance of the same sex marriage which would eventually make government bring changes.
- **Pressure on Legislature** may also come from the side of the opposition parties who may be sympathizing with the cause of homosexual couples.
- **Implementing SC verdict** regarding various protection being available for queer couples.
 - » This will require strong political will and strict judicial oversight as even during Navtej Singh Johar judgment, the SC had directed the state to ensure that the judgment is given wide publicity through media and government should initiate programs to reduce stigma associated with homosexuality. Five years later, almost nothing has been done in this regard.

- **Conclusion:**

- The LGBTQIA+ community was gazing upon the Supreme Court with a profound sense of optimism. Though they were relieved about the recognitions granted in the minority judgment, they have been left disheartened by the final verdict.

2) SOCIAL JUSTICE: DEMAND FOR MARATHA RESERVATION

- **Why in news?**
 - » Agitation by Maratha groups in Maharashtra over demand for reservation again took violent route with many cases of arson, loot and public property destruction (Oct-Nov 2023)
 - Maratha leader Manoj Jarange Patil ends fast, warns of 'choking Mumbai' if no quota is ensured by 2nd Jan 2024
- **Example Questions:**
 - » Examine the reasons for recent increase in demand for reservation among the dominant caste groups in India. What could be its impact on the social and political landscape of the country [15 marks, 250 words]
 - » Evaluate the role of reservation policies in achieving social justice and equality in a diverse country like India. [10 marks, 150 words]
- **Introduction**
 - » The last decade has seen various traditionally powerful and influential communities such as Jats in Haryana, Patidar in Gujarat, Kapu in Andhra Pradesh and Marathas in Maharashtra agitating and demanding for OBC Status. The recent protest in Maharashtra is a continuation of this trend.
- **Reasons for such demands/agitations**
 - » **Farming and Employment Crisis:**
 - Agriculture sector over the years have suffered due to land fragmentation, increased input cost, climate change, land degradation etc. It has impacted the income of landed groups and a lot of farmers have turned into small and marginal farmers or even agricultural laborers. These people don't have access to good quality education and skilling opportunities which impacts the jobs available for them.
 - » **Exploitation of vulnerable groups in private sector jobs** because of lack of job security, weakening of labor laws and excesses by the employer. This makes everyone look for limited number of government jobs and here reservation plays a crucial role.
 - » **Perception of Economic Marginalization:**
 - These groups perceive that in the era of globalization and industrialization, they have been left behind and see reservation as a mechanism to access higher education and stable government jobs.
 - » **Sub castes or Parallel castes which got reservation** (like Yadavas in Haryana, Jats in Rajasthan, Kunbis in Maharashtra) have shown an improvement in socio-economic conditions.
 - For e.g., Maratha families witnessed the dramatic rise of poorer-than-them families from society's lower strata. They attributed the rise of Dalits and OBCs to reservation.
 - » **Political Aspirations of the caste leaders:** Mobilizing the community for reservation gives an opportunity for the caste leaders to bring a name for themselves and thus achieve political goals.

- **Should these groups be given reservation?**

- » The national and state backward class commissions have found that these communities are not socially and educationally backward and are adequately represented in the services. Therefore, their past requests for inclusion in OBC has been rejected.
 - **For e.g.**
 - Marathas from 33% of Maharashtra's population, are among the strongest of all communities in the state.
 - 12/20 chief ministers of Maharashtra have been from Maratha community. Current CM and Deputy CM are from this community.
 - In education sector, most major private deemed to be universities in the state, like Bharti Vidyapeeth, DY Patil University are found and run by Marathas.
 - In fact, even when governments granted reservation to these groups, it was declared **unconstitutional in Supreme Court verdicts** (E.g. in May 2021, the SC struck down the quota for Marathas under the state's Socially and Educationally Backward Class (SEBC) Act, 2018)
- » Since they are not meeting the objective criteria, they are resorting to an exercise of coercive power on governance. If government agrees to these demands, it will set a wrong precedent.
- » **The Constitution** already provides for 10% reservation for the EWS category for people belonging to non-reserved class.
- » Giving reservation to these "upper caste" group would go against the spirit of affirmative action that has guided the eligibility quotas in central and state lists.
- » **Therefore, no, these groups should not be given reservation, but rather steps should be taken to relieve the above mentioned grievances.**

- **Way forwards**

- » **Reforming Agriculture Sector:**
 - Since a large section of these dominant groups are dependent on agriculture, its very important to bring reforms in agriculture to increase agri-income. Various recent initiatives like PMKSY, PMFBY, e-NAM, Increased MSP are steps in this direction.
 - Government should also focus mechanisms to promote rural industries including in the Food Processing Sector to ensure economic opportunities for everyone.
- » **Improving Quality of Higher Education in Private Institutions:**
 - The demand for reservation is strengthened by the fact that among HEIs, government colleges where the provision for reservations are implemented provide affordable good quality educations. Private colleges are not only expensive but lack good quality.
- » **Focus on Skilling of the workforce** so that they can easily get jobs in the private sector.
- » **Special focus on labor intensive manufacturing sectors** to ensure employment opportunities for the youth in the country.
- » **Effective regulation of private sectors** to ensure good working conditions, dignity and stability for workers to ensure that the most vulnerable are spared the excess of market.
- » **Review Reservation Policies:**
 - To make it more inclusive and exclude well to do section from it.
 - Strict implementation of Creamy layer provision among OBCs and introduction of creamy layer provisions for SCs/STs will go a long way in improving the inclusivity of the reservation provisions.

- » **Stop politicizing the issue:** The political class should desist from pandering into these demands and take an unequivocal stand that Socially Advanced Castes cannot be included in the list of Socially Backward Classes.
- **Conclusion:**
 - » The demand for reservation will keep emerging among different sections of societies if economic distress increases and therefore government should focus on skill development, encourage entrepreneurship and enhance the overall economic opportunities in the country.

3) SOCIAL JUSTICE: MGNREGA

- **Why in news?**
 - » Union Government SOP permits drone usage for investigating corruption complaints or other violations at MGNREGA worksites (Aug 2023)
 - » Standing Committee on Rural Development & Panchayati Raj highlights various issues with MIGREGA and gives recommendations (July 2023)
- **Example Questions**
 - » Discuss the keyways in which MGNREGA has contributed in the socio-economic sphere of rural India. What are the key challenges being faced currently in the implementation of the program. [15 marks, 250 words]
- **Introduction**
 - » Mahatma Gandhi National Rural Employment Guarantee Act 2005 is a statutory job guarantee scheme for rural India.
 - » It's an initiative by MoRD, which was launched in 2006. It is aimed at:
 - Enhancing the livelihood security of people in rural areas by legally guaranteeing 100 days of wage-employment in a financial year to adult members of any household willing to do unskilled manual work related to public work at the statutory minimum wage.
 - Creating **durable assets** (such as roads, canals, ponds, wells)
 - » The scheme also helps in protecting environment, empowering rural women, reducing rural urban migration, and fostering social equity, among others.
- **Other Key Features**
 - » **Demand Driven Program:** Workers are provided work when they demand it and not when the government wants it.
 - » Employment is to be provided within 5 km of an applicant's residence.
 - » If work is not provided within 15 days of applying, applicants are eligible for an unemployment allowance.
 - » **1/3rd** of the stipulated workforce should be women.
 - » **Social audit** of the work done by Gram Sabha.
- **Steps taken to improve the functioning.**
 - i. **Management Information System** - digitization of all process in MGNREGA - available in public domain - promotes transparency.

- ii. **Mandatory expenditure on agriculture and allied sector:**
 - » As per the provision of the Act, the District Programme Coordinator is required to ensure that at least 60 per cent of the works to be taken up in a district in terms of cost shall be for the creation of productive assets directly linked to agriculture and allied activities through development of land, water, and trees.
- iii. **Training and Skill Development of Workers:**
 - » Training of MGNREGA workers under initiatives like Bare Foot Technicians (BFT) to move than up the skilling ladder.
 - » Similarly, project "UNNATI" focuses on upgrading the skill base of MGNREGA workers.
- iv. **Other technology to Reduce Corruption and improve transparency:**
 - » DBT through E-Payments are used for payment of wages which is ensured fast payment and reduced siphoning of resources.
 - » **Geo-Tagging of assets** to reduce corruption.
 - Rolled out in 2017 and more than 5.2 crore assets (Jan 2023) have been geo-tagged and made available in public domain.
 - » **National Mobile Monitoring Software (NMMS)** App was launched in 2021 which permits taking real time attendance of workers in MGNREGA worksites with a geo-tagged photograph.
 - It is a big step toward step towards bringing transparency and proper monitoring of the schemes and will help in increasing oversight of the program.
 - » **According to a SOP** recently (Aug 2023) issued by MoRD, drones will be used for monitoring of MGNREGA work. It will be used in four types of monitoring: Surveying the ongoing works, inspecting the completed works, impact assessment, and special inspections in case of complains.
- v. **Regular verification of Job Cards (JC) to weed out the bogus and duplicate JCs**
- vi. **Efforts to cover all landless households:**
 - » As per the SECC 2011, there are 5.5 crore households in India which fall in the landless category. Government is taking measures to get all these households a Job Card and thus employment under MGNREGA.

- **Performance of the Scheme:**
 - i. **Positives/Achievements**
 - » **Various Government Reports** have indicated that MGNREGA has led to:
 - **Reduction in Poverty:** The program reduced poverty by 32 percent and prevented 14 million people from falling into poverty.
 - **Raised Income level:** Although it fails to add to the number of days that Individual work, it attracted individuals who were previously employed in less productive work, thereby raising their income.
 - **Relief during distress situations**
 - **During COVID-19 crisis** it had emerged as a mechanism to ensure jobs for migrants returning back home and

- It serves as an important source of income during distress situations such as drought, famine etc. Additional employment opportunities is made available in these circumstances.
 - **Upliftment of weaker sections** like women, SCs and STs through creation of livelihood opportunities.
 - Increase in women's control over resources: MGNREGS scheme may be the first opportunity for many women to earn cash income resulting in substantial increase in women's control over resources- including cash in hand and likelihood of having a bank account.
 - The % of SC workers in MGNREGA has been around 20% and ST workers around 17%.
 - **Impact on Education of Children**: Higher level of educational attainment for children: MGNREGS households were likely to obtain higher level of educational attainment and were less likely to be working.
 - **Rise in financial inclusion**: during this period, there has been a general increase in financial inclusion, reliance on moneylender has gone down and accessing of formal credit grew.
 - **Development of Rural Assets**
 - Irrigation canals and roads have augmented rural infrastructure.
 - **Mitigation of climate change** - through water conservation, drought prevention, reforestation and flood control activities.
- **International praises**
- In World Development Report 2014, the world Bank termed it a "stellar example of rural development."
- ii. Shortcomings/Limitations in implementation**
- **Factors which adversely affect the implementation of MGNREGA**
 - » **Funds constrains.**
 - Parliamentary Standing Committee has also raised concerns about slashing of the budget for MGNREGS. In the FY 2023-24, the allocations for MGNREGS have been drastically slashed to Rs 60,000 crores for this financial year from a Rs 73,000 crore budgetary estimates for 2022-23.
 - This allocation is much lower than World Bank recommendations of Rs 1.7% for the optimal functioning of the program.
 - » **Disparity of wages across state and Wages less the minimum wages in many states:**
 - Parliamentary committee in a report in 2023 has highlighted that daily wage rates ranged from Rs 204 to Rs 331 in different states and UTs.
 - According to the new wage rate notified for FY2023-24, the lowest wage is in Chattisgarh and MP at Rs 221, while the highest is in Haryana at Rs 357.
 - » **Delays in wage payment sometimes discourages work under MGNREGA. It also increases the chance of corruption.**
 - » **Institutional Shortcomings:**

- PRIs suffer from challenges like inadequate administrative and technical expertise:
 - This adversely affects proper planning, approval, monitoring and social audit of the scheme.
 - Inadequate technical staff to help unskilled workforce.
 - » **Non-Appointment of Ombudsmen:**
 - Under the act, there should be an ombudsperson for each district who will receive grievances, conduct enquiries, and pass awards.
 - Standing committee in 2022 noted that out of 715 possible appointments, so far only 263 ombudsmen have been appointed which shows poor coordination between central and nodal agencies.
 - » **Quality of Assets** which are getting created have turned out to be of incomplete or of poor quality, requiring repairs every year.
 - » **Cases of corruption / lack of transparency**
 - Social audit hasn't been very effective because of lack of cooperation from government officials. Further, non-compliance with transparency and accountability provisions and poor maintenance of records are impacting the implementation of the mega scheme.
 - **Fabrication of jobs cards** and associated corruption.
 - » **Inadequate coverage of person with disabilities and women in many states** is impacting inclusive aspect of the scheme.
 - » **Some Issues specific to women:**
 - Lack of childcare facilities and basic amenities at the site like clean drinking water, sanitation facilities impact health and safety of women.
 - Lack of awareness about the process and entitlements available under the scheme.
- **Steps that need to be taken**
- i. **More Funds:** MGNREGA has the potential to change the face of rural India and hence more funds should be allocated for the scheme.
 - ii. **Minimum wage:** MGNREGA wages should be linked with Minimum wages act (Now The Code on Wages) and no state should be allowed to pay less than the statutory amount.
 - » Parliamentary Standing Committee has recommended that government should explore the possibility of making the wages paid under the scheme uniform across the country.
 - » Wages should also be linked with CPI-R rather than CPI-AL which is an outdated index.
 - iii. **Capacity Building of PRIs** by empaneling institutions that can be training institutions for MGNREGA.
 - » **More technical human resource** needs to be provided at rural level to improve the quality of the assets which are getting created.
 - » **Better Planning for durable infrastructure** creation.

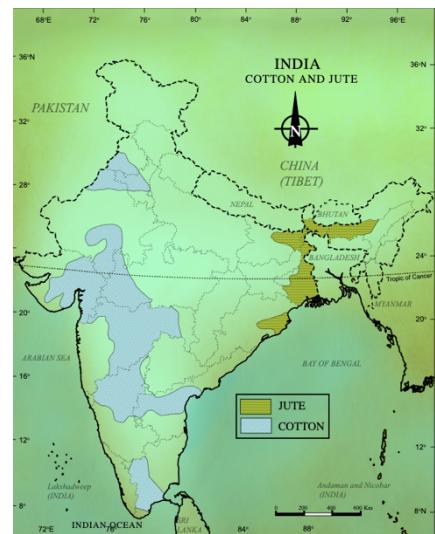
- iv. **Appoint Ombudsperson** in all districts on high priority to ensure simple and effective grievance redressal.
- v. **Monitoring** of the projects needs to improve.
 - » Strengthening Social Audit: CAG should develop mechanism in consultation with other stakeholders to handhold Gram Sabhas to ensure regular social audits of all projects under MGNREGA.
 - » Civil Society can also monitor the Information Management system to ensure that the program is properly implemented.
- vi. **Promoting the use of Adhaar based biometric verification** to prevent fake job cards etc.
- vii. **Improved facilities at workplace** specially for women laborers. (E.g., Clean Sanitation facilities, child care facilities etc.)

- **Conclusion**

- » Since, MGNREGA has proved its socio-economic advantages for rural areas, the program should be continued in full throttle. But, at the same time it is important that the work being done under it is producing something concrete & sustainable and that there is a transparent grievance redressal mechanism for the unskilled work force which has worked under MGNREGA or is seeking work under MGNREGA.

1) AGRICULTURE: COTTON

- **Example Questions**
 - » What are the key climatic requirements of Cotton cultivation. How is cultivation of cotton distributed geographically in the country? [10 marks, 150 words]
- Cotton is one of the principal commercial crops of India and it provides livelihood to about 6.0 million cotton farmers.
 - » **India is the largest producer and consumer of Cotton** in the world. Adoption of Bt Cotton in 2000s enabled significant increase in cotton production from 10 million bales in 2001-02 to 34.3 million bales in 2022-23.
 - » It is an indigenous crop which is sown as Kharif Crop in semi-arid region of the country. It takes 6-8 months to mature.
- **Suitable Climate Condition for Cotton**
 - » Cotton is a crop of tropical and subtropical areas and requires uniformly high temperatures between **21 degrees and 30 degrees C**. The growth is negatively impacted if the temperature falls below 20 degree C. Frost is harmful for the crop.
 - » The crop has **modest water requirement** (average annual rainfall of **50-100 cm**) and can be grown in areas with lower rainfall with the help of irrigation.
 - » **Good sunshine** is a must at the time of flowering and moist weather or heavy rainfall at the time of ball opening and picking are detrimental to the crop.
- **Other requirements**
 - » Cheap and skilled labor force at the time of picking of cotton. Normally the picking season is spread over a period of 3 month.
 - **Traditionally**, it is cultivated on the **lava plateau of Deccan** and therefore the soil here is called the **Black Cotton soil**.
 - In **Tamil Nadu**, it can be grown both in Kharif and Rabi season as there is **no threat of frost** which is dangerous for the cotton production.
- **Total Production and Distribution of Cotton Cultivation in India:**
 - » India has the world's highest area under cotton cultivation which accounts for around 6% of the net sown area. India produces **6 million tonnes** of Cotton every year, which is **about 23% of the world cotton**.
 - » India also produces **51%** of the total organic cotton production of the world, which demonstrates India's effort towards sustainability.
 - » There are **three major cotton producing regions** in India:
 - Southeast Punjab, Western Haryana, and Northern Rajasthan



- ii. Gujarat, Maharashtra and neighboring Southern Rajasthan in Western India
- iii. North Karnataka, Andhra Pradesh and Tamil Nadu

- **Initiatives:**

» **Budget 2023-24:**

- To enhance productivity of extra-long staple cotton, we will adopt **a cluster based and value chain approach through Public Private Partnerships (PPP)**.

This will mean collaboration between farmers, state and industry for input supplies, extension services, and market linkages.

- **Various types of cotton grown in India:** Three broad types of cotton are generally recognized on the basis of length, strength, and structure of the fiber.

a. **Long Staple Cotton**

- Cotton with longest fiber (24 to 27 mm)
- Fine and shining quality, used for superior quality of clothes.
- About 50% of the cotton produced in the country is long stable type.

b. **Medium Staple Cotton**

- Length of the fiber (20 to 24 mm)

c. **Short staple cotton**

- Inferior cotton with less than 20 mm length. Used for making inferior cloth and fetches less price.

- **Conclusion**

- Cotton cultivation, together with cotton textile industry employs millions of people in India and therefore can play a very important role in improving the employment situation in the country.

A) PINK BOLL WORM (PBW) RESISTANCE AGAINST BT COTTON AND CHALLENGE TO SUSTENANCE OF BT COTTON

- **Background:** Indian farmers have faced consistent loss of Bt Cotton crops due to pink bollworm attacks since the mid-2000s, when scientists found that the insect had became resistant to the genetically modified variety of cotton.

» **About PBW:**

- PBW is a worm that destroys parts of the developing cotton fruit, such as the square (flower bud) and the boll (rounded sac of seeds with cotton fibres).
- Adult worms are thin grey moths that lay eggs on buds, flowers, and bolls. The larvae hatch from the eggs and burrow into the bolls to feed on the seeds. It cuts through the lint and stains it in the process, resulting in a loss of quality

» Bt Cotton was encoded with Cry1Ac toxin which protected it from all three species of bollworms (American, spotted, and pink bollworm)

- Later, Cry2Ab gene was also added in Bt Cotton to improve protection against the American Bollworm.

» But, in 2008, scientists in India found unusual survival of Pink bollworm in Amreli district of Gujarat, indicating of Pest's resistant to Bt cotton.

- By 2014, it was clear that Pink Bollworm had become resistant to both Cry1Ac toxin as well as Cry2Ab toxin.
 - **PBW** is more dangerous than American Bollworm as it feeds from inside the bolls and thus remains elusive in the initial stages and is seen in harvest stages when the damage is already done. As it feeds from inside, no amount of pesticide help control it.
- **How was resistance developed by PBW: Key Factors:**
 - » **Early Sowing and Late Sowing:** The ideal time for sowing cotton is April 15 to May 15. But many farmers in the northern belt of Haryana, Rajasthan and Punjab have started sowing from March end or the first week of April and extend it up to June end, which is an increase from 45 days to 80 days.
 - The early sowing season coincide with the time the PBW comes out of hibernation or the diapause stage in the winter months. The pest survives in this stage between two cotton seeds or cotton crop residue.
 - The cotton plants are at bud or flowering stage, during which the PBW searches for food and begins feeding on bolls during the larval stage, which continues for 14-17 days. It eventually starts laying eggs.
 - The issue worsens for farmers who sow late. The process enables worms to access food for longer periods and increasing generations.
 - » The **longer duration of cotton varieties** in the south and central India, which lasted upto 150-160 days, helped the pest develop resistance to the genetically modified varieties.
 - » **Not Planting other varieties against Advice:** Farmers were repeatedly advised to plant indigenous, hybrid varieties of cotton alongside Bt to prevent developing resistant. "The crossbreeding of pests from different varieties of plants would have prevented developing tolerance for longer years". But farmers haven't followed the advice.
- **Cotton Crops across the North-Indian States**, Punjab, Haryana, and Rajasthan are reporting a severe pink bollworm attack and even Bt-Cotton is falling prey to the pest it was created to resist. (Oct 2023)
- **Impact:**
 - » **Damage to crops:** Damage in 2023, is the highest since 2001 - both according to government and farmers.
 - **Note:** Before 2001, the American bollworm created havoc and ruined lives of farmers.
 - » **Difficult to find laborers:** As laborers refuse to pick leftover crop as yield is too low
 - » **Difficult to find buyers** as traders refuse to buy citing poor quality.
 - » **Farmer Suicide:** In Sep 2023, Sri Ganganagar district saw first farmer suicide in over a decade. It was due to the fact that farmer had a lot of debt accumulated due to loss of cotton crop consecutively for 3 years.
 - » **Farmers giving up cotton cultivation** in the northern belt (for e.g. the production of cotton in Punjab has almost halved in the past decade).
- **Way Forward:**
 - Effective monitoring and timely adoption of a crop-window based integrated pest management (IPM) is the immediate solution.
 - Scientists are also experimenting with a technology that has proven successful in the USA. This is called PBKnot or PB Rope L.

- It involves using a 20 cm polyethylene hollow rope that is impregnated with pheromone gossyplure - chemical emitted by female moths - to attract male moth. This confuses the male moth and prevent them from reaching the actual female moth. This thus disrupts the mating process and reproductive cycle.

- **Conclusion:**

- While promoting Crop-Wise Integrated Pest Management, the GoI also needs to promote PBKnot a biotechnology tool and implement it in all cotton-producing states.

2) S&T: CAR-T CELL THERAPY: NEXCAR19 – INDIA’S FIRST INDIGENOUSLY DEVELOPED CAR-T CELL THERAPY

- **Why in news?**

- The CDSCO has granted market authorization for NexCAR19, India’s first indigenously developed CAR-T cell therapy, to ImmunoACT (Nov 2023)

- **Practice Questions:**

- Explain the mechanisms of CAR-T Cell therapy? Discuss the key advantages of NexCAR19 over other foreign CAR-T cell therapies [15 marks, 250 words]

- **Background: How Cancer has been treated before CAR T-Cell Therapy:**

- **Surgery** (removing the cancer)
- **Radiotherapy** (delivering ionizing radiation to the tumour)
- **Systematic Therapy** (administering medicines that act on tumour)
 - » The earliest form of systematic therapy was chemotherapy. It preferentially acts on cancer cells because of the latter’s rapid, unregulated growth and poor healing mechanisms. These drugs have modest response rate and significant side effects as they effect numerous cell types in the body.
 - » The next stage in its evolution was targeted agents a.k.a. immunotherapy: The drugs bind to specific target on the cancer or in the immune cells that help the tumour grow or spread. This method often has less side effects as the impact on non-tumour cells is limited. However, it is effective only against tumours that express these targets.

- **CAR-T Cell Therapy** has emerged as a new development in this front.

- It is a revolutionary therapy that modifies immune cells, specifically T-Cells, by turning them into potent cancer fighters known as CAR-T Cells.

▫ **How it works?**

- » In CAR T-cell therapy, the patient’s blood is drawn to harvest T-cells – immune cells that play a major role in destroying tumour cells.
- » Researchers modify these cells in the laboratory so that they express specific proteins on their surface, known as chimeric antigen receptors (CAR): they have an affinity for proteins

on the surface of tumour cells. This modification in the cellular structure allows CAR T-cells to effectively bind to the tumour and destroy it.

- » These modified cells are then infused back into the patient's blood stream after conditioning them to multiply more effectively.
- » The cells are even more specific than targeted agents and directly activate the patient's immune system against cancer, making the treatment more clinically effective. This is why they are called '**living drugs**'.
- **Advantages of CAR-T Cell therapy over other Cancer fighting methods:**
 - » It is very accurate and only targets cancer cells.
 - » It makes the treatment easier with onetime therapy (unlike several sessions of chemotherapy)
 - » It can also fight non-responsive cancer patients.
 - » It is designed to cure and provide lifelong benefits.
- **CAR T-Cell Therapy in India:**
 - The first major clinical trial showing they were effective was published almost a decade ago. The first indigenously developed therapy in India was successfully performed only in 2021.
 - **In Oct 2023, the Central Drugs Standard Control Organization (CDSCO) granted market authorization for NexCAR19, India's first indigenously developed CAR-T cell therapy, to ImmunoAct, a company incubated by IIT Bombay. This paves the way for commercial launch of this therapy in India.**
 - It is designed to target cancer cells that carry the CD19 protein. This protein acts like a flag on cancer cells, which allows CAR-T cells to recognize and attach themselves to the cancer cells and start process of elimination.
 - **Who can get the NexCAR19 therapy?**
 - » The therapy is for people with B-Cell lymphomas who didn't respond to standard treatments like chemotherapy, leading to relapse or reoccurrence of the cancer.
 - » **B-Cell leukaemia is most common among children. Are they also eligible?**
 - For now, therapy's approval is only for patients aged 15 years and above.
 - The pediatric trial phase is currently underway at the Tata Memorial Hospital, in collaboration with IIT-Bombay.
 - **Significance:**
 - » India is one of the first developing country to have its own Car-T therapy. Even some developed nations don't have their own CAR-T therapies and they import from USA or Europe.
 - » This reduces the cost of treatment to about 1/10th of the cost abroad and has the potential of boosting medical tourism in India. It costs around Rs 3.3 crores abroad while in India it will cost somewhere between 30-40 lakh rupee.
 - » Lab and animal studies have shown that **NexCAR19** lead to significantly lower drug-related toxicities. For e.g., it causes minimal damage to neurons and the central nervous system, a condition known as neurotoxicity. The therapy also leads to minimal Cytokine Storm.

Syndrome (CRS), which is characterized by inflammation and hyperinflammation in the body due to the death of a significant number of tumour cells, as CAR-T cells are designed to target and eliminate cancer cells.

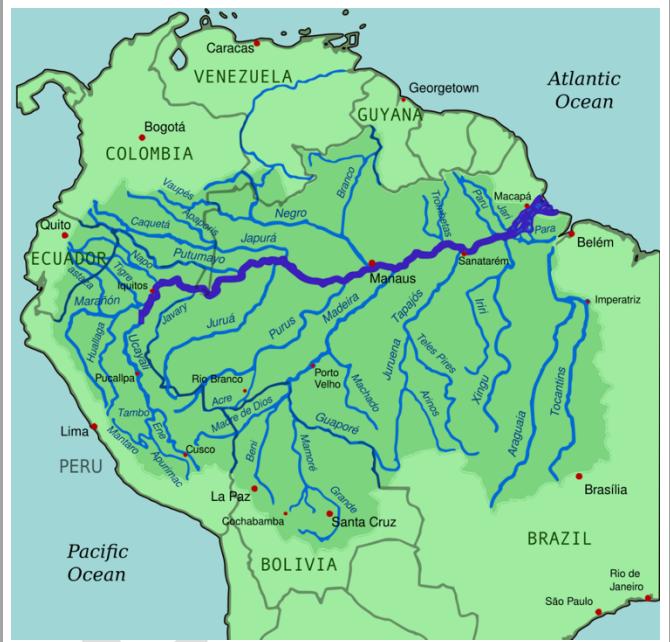
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3. PRELIMS FACTS:

1) PLACES IN NEWS: AMAZON RIVER

Amazon River:

- Amazon river is the river with largest drainage system in the world in terms of volume of its flow and the area of its basin.
 - It is estimated that about 1/5th of all water that runs off Earth's surface is carried by Amazon. The immense amount of freshwater flowing into Atlantic dilutes the ocean's saltiness for more than 160 kms from shore.
- **Length:** The total length of the river - as measured from the headwaters of Ucayali-Apurimac river system in the southern Peru is atleast 6400 km which makes it slightly shorter than Nile river.
- **Source:** The source of the river is in Andes mountains and the mouth is in Atlantic Ocean.
- **Controversy:** Both length and source of the river have been debated and some claim that the river is longer than Nile.
- **Drainage Basin:** The entire area that Amazon river drains is the largest river basin in the world. It drains part of Brazil, Peru, Ecuador, Columbia, Bolivia and a small part of Venezuela, Guyana and Suriname.



- **Amazon river is not building Delta:** Most of the estimated 1.3 million tons of sediments that the amazon pours daily into the sea is transported north by coastal currents to be deposited along the coasts of Brazil and French Guiana.
- **Affects sea level in Caribbean Sea:** The Amazon river releases so much fresh water into the Atlantic sea, it alters the sea level in the Caribbean. The amazon water get picked up by Caribbean current, which carries the water to Caribbean island.

B) AMAZON BASIN FACING WORST DROUGHT IN 122 YEARS (OCT 2023: DTE)

- The Amazon river is currently experiencing a severe drought, which has caused the region's waterways to reach their lowest levels since the early 20th century.
- **Reasons:** Climate Change and El Nino are likely factors.
- **Impact:**
 - **Increasing wildfires** -> devastating effects on region's air quality.
 - **Biodiversity Loss:**
 - » E.g. Abnormally hot water temperatures, combined with diseases, pollution and low water levels, resulted in death of at least 100 Amazon River Dolphins (Inia geoffrensis), a species listed as EN by the IUCN.

- » Similarly, the regions caiman species (the black caiman, spectacled caiman, Cuvier's caiman and the smooth-fronted caiman) are also likely to be adversely impacted.
- » **Food shortage** because of reduced production of fruits, vegetables etc is becoming a reality.
- **Increased human animal conflict:**
 - » E.g. increased human-caiman conflicts are already occurring i.e. there is increasing alligator attacks on humans.

2) S&T: BIOLOGY: CHONDROCYTES PRODUCING HAEMOGLOBIN

- **Why in news?**
 - » Haemoglobin isn't used only in blood, scientists find in major discovery (Nov 2023: Source: TH)
- **About Haemoglobin and its functions**
 - » **Haemoglobin (Hb)** is a protein found in the red blood cells that carries oxygen from the lungs to the body's tissues and returns carbondioxide from the tissues back to the lungs.
 - » It is made up of four protein molecules (globulin chains) that are connected together. Each globulin chain contains an iron containing compound termed heme. Embedded within the iron compound is an iron atom which is vital for transporting oxygen and carbondioxide in our blood. This iron contained in the haemoglobin is also responsible for the red color of the blood.
- » **Normal haemoglobin levels:**
 - The normal range of haemoglobin depend on the age and, beginning in adolescence, the gender of the person.
 - **Adult male:** 14 to 18 gm/dL
 - **Adult female:** 12 to 16 gm/dL
- **Recent Updates (Nov 2023)**
 - » In a study published in ***Nature***, scientists have reported that cells that make cartilage, (the connecting tissue between bones) also make haemoglobin.
 - **Note:** The primary cells that makes cartilage is the Chondrocyte.
 - » **Scientists at Beijing Institute of Biotechnology** the chondrocytes within the growth plates of newborn mice were not only producing large amount of haemoglobin, but also that it was coalescing and forming large blobs without a membrane. The scientists called these blobs haemoglobin bodies or **Hedy**.
 - » **Are these haemoglobin bodies (Hedy) functional?**
 - Scientists found that removing the gene that made haemoglobin specifically in the cartilage tissue resulted in cell deaths among the chondrocytes. It was clear that Hedy was essential for chondrocytes to live.

- » **Does haemoglobin also carries oxygen in chondrocytes?**
 - Scientists found that cartilage tissue synthesized a large amount of haemoglobin to cope with hypoxic conditions.
 - They found that cartilage that didn't contain haemoglobin showed signs of hypoxic stress.

3) EB&CC: UNEP'S CHAMPION OF THE EARTH AWARD

- **About the Award**
 - » Instituted in 2005, it is the highest environmental honour of the UN, which is given annually and recognizes outstanding figures from the government, civil society and private sector whose actions have had a transformative, positive impact on environment.
 - » The award is given in **different categories** including Policy Leadership, Science and Innovation, Entrepreneurial Vision, Inspiration and Action, lifetime achievement etc.
- **In Oct 2023**, awards were given to:
 - » **Josefina Belmonte**, Mayor of Quezon City in the Philippines (Policy Leadership), the UK based Ellen MacArthur Foundation (Inspiration and Action), China's Blue Circle (Entrepreneurial Vision), Jose Manuel Moller of Chile (Entrepreneurial Vision) and Council for Scientific and Industrial Research (CSIR) (Science and Innovation) were declared winners "for the innovative solutions and transformative actions to tackle plastic pollution".
 - » **Belmonte** is driving environmental and social change through a raft of policies to combat climate crisis, end plastic pollution and green Quezon city.
 - » **The MacArthur Foundation** has played a leading role in mainstreaming a lifecycle approach, including for plastics.
 - » **Blue Circle** is China's largest marine plastic waste program. It uses blockchain and IoT to track and monitor the full lifecycle of plastic pollution - from collection to regeneration, remanufacturing and resale.
 - » **Jose Manuel Moller** is the founder of Algramo, a social enterprise dedicated to providing refill services that reduce plastic pollution and lower cost of everyday essentials.
 - » **South Africa's CSIR** uses cutting edge technology and multidisciplinary research to develop innovations to tackle plastic pollutions and other issues.
- **Award to PM Modi in 2019**
 - » He was selected in **leadership category**.
 - » For his championing of International Solar alliance, a global partnership that aims to scale up solar energy in 'solar-resource' rich countries and for his leadership in the fight against plastic pollution.

4) EB&CC: MOTHS

- **Why in news?**
 - » Study identifies 37 rare moth species in Kerala, three first time in India: ZSI (Nov 2023)

About Moths:

- Moths are group of insects that include all members of the order Lepidoptera that are not butterflies.
- **Kingdom: Animalia; Phylum: Arthropoda; Class: Insecta; Order: Lepidoptera**
- **Note:** Lepidoptera is an order of insects that includes butterflies and moths.
- While butterflies are pollinators, moths are largely considered crop pests. Though some moths pollinate the flowers that bloom at night.

Significance of Moths:

- They perform some **essential ecosystem services**, including pollination, nutrient cycling and providing prey to birds and bats.
- Moths are nocturnal and potential indicators of ecosystem health and changes. Therefore, in agro-ecosystem, moth abundance is positively related to abundance of crops.

Problems caused by Moths:

- Several moths are considered pests.



Important Moths:

- **Silkworm moth**, (*Bombyx mori*) in its caterpillar stage is used for silk production (sericulture) for thousands of years. The species has undergone complete domestication with the species no longer being found in the wild.

- **About the Zoological Survey of India's study on Moths in Kerala:**
 - The study was conducted through a two - year long survey from 2018.
 - **Key Findings:**
 - » The study identified 37 new moth species including **3 new species discovered first time in India**. These were Aeolarcha eaphthalma, Pharambara micacealis, and Tirathaba leucotehars.
 - » There has been a decline in the diversity due to excessive use of pesticides, radiation and air pollution.

5) EB&CC: BIODIVERSITY: CANDOLLEOMYCES ALBOSQUAMOSUS: NEW MUSHROOM SPECIES FROM WESTERN GHATS (OCT 2023: TH)

The mushroom sports a honey-yellow cap, white stem, and grows to 58 cm.

Its habitat includes dead logs or bamboo culms in the natural forest.

Significance: The discovery of the new species of genus Candolleomyces in India is special given that there are only 35 species in this genus worldwide.





CURRENT AFFAIRS PROGRAM

PRE-CUM-MAINS 2024

NOV 2023: BOOKLET-2

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1) SUBCATEGORIZATION OF OBCS

- **Why in news?**
 - » OBC and subcategories: Why this has been a hot-button issue for long (Oct 2023: Source: IE)
- **Introduction:**
 - » **OBCs**, the beneficiaries of 27% reservation in central government jobs, are not a monolith. Within the OBC are hundreds of castes, all at different level of marginalization.
 - » A perception has developed that some dominant groups in OBCs are reaping the benefits and advantages of reservation whereas the very marginalized groups are not able to reap the benefits. Therefore, a demand for subcategorization and sub-reservation within the OBC community emerges.
 - It should be noted that some states like Andhra Pradesh, Jharkhand and WB etc. already have such kind of subcategorization.
- **Past Commissions and their recommendations about Subcategorization:**
 - i. **First OBC Commission** headed by Kaka Kalelkar was constituted in 1953 during the time of Jawaharlal Nehru's government. It submitted its report in 1955.
 - » This commission prepared a list of **2,399 backward castes** in the country and categorized **837 of them as "most backward"**.
 - » This report was never discussed in the Parliament and never implemented.
 - ii. **Second OBC Commission: BP Mandal Commission**: It was appointed by 1979 Morarji Desai's Janta government, but its implementation was announced only in 1990 by VP Singh Government.
 - » Here no subcategorization was recognized; But one of the members, L R Naik had said in his dissent that OBCs should be split into intermediate backward classes and depressed backward classes.
 - iii. **In Feb 2014, the NCBC examined the issue of subcategorization** which in its report suggested that OBCs should be subcategorized into Extremely Backward Classes, More Backward Classes and Backward Classes. This recommendation was not implemented.
- **In Oct 2017 a new Commission for Subcategorization of OBCs was constituted** under the chairpersonship of **Justice G Rohini**, a retired judge of Delhi High Court.
 - » Its original tenure of 12 weeks was extended 14 times till it submitted its report on 31st July 2023. This report hasn't been made public yet.
 - » **Terms of Reference**: Originally, it had three terms of reference.
 - Examining the extent of inequitable distribution of benefit of reservation among different castes of OBCs in the Central List.
 - Develop a scientific criteria/mechanisms/parameters for subcategorization.
 - Identify respective castes/communities/sub-castes in the central OBC list and classify them into respective sub-categories.

- A fourth, was added later: To study the various entries in the Central List of OBCs and recommend correction of any repetitions, ambiguities, inconsistencies and errors of spelling or transcription.

- Note: Article 340 of the Indian Constitution provides that the President may by order appoint a commission to investigate the conditions of backward classes.

- Findings So far:
 - » In 2018, the Commission analysed the data of 1.3 lakh central jobs given under OBC quota over the preceding five years and OBC admissions to central higher education institutions, including universities, IITs, NITs, IIMs and AIIMS, over the preceding three years. The findings are:
 - 97% of all jobs and educational seats have gone to just 25% of all sub-castes classified as OBCs;
 - 983 OBC communities — 37% of the total — have zero representation in jobs and educational institutions;
 - 994 OBC sub-castes have a total representation of only 2.68% in recruitment and admissions

 - » What is the current level of OBC recruitment in Central Jobs:
 - As per the 2018-19 annual report of the Department of Personnel and Training, OBC representation is 13.01% in group-A central government services, 14.78% in group-B, 22.65% in group-C (excluding safai karmacharis) and 14.46% in group-C (safai karmacharis).

 - RTI information tells us that there was not a single professor or associate professor appointed under OBC quota in Central Universities.
 - The data showed that 95.2% of the professors, 92.9% of associate professors and 66.27% of assistant professors were from the general category (which may also include SCs, STs and OBCs who had not availed the quota). At assistant professor level, representation of OBCs was just 14.38%

- Need of Sub-categorization
 - » Equitable distribution of benefits: A perception that only a few affluent communities among the over 2,600 included in the Central List of OBCs have secured a major part of 27% reservation.
 - » Focus Policy implementation: Various government policies can be tailored specifically to meet the requirements of the most vulnerable groups.
 - » NCBC had recommended subcategorization in 2015

- Other Impacts of Subcategorization

- » It will be a significant addition to the Mandal Commission-based OBC system.
 - » **Political Implication:** It is being seen as an attempt by government to reach out to the most backward classes.
- **Hurdles that subcategorization may face:**
- » It may be opposed by dominant OBC groups and regional parties dominated by dominant OBC groups.
 - » **Subcategorization with OBC Enumeration** would be a challenge as caste based population data is not publicly available and central government has shown reluctance towards the idea of caste census.
 - » Subcategorization would make proper allotment of seats to each reserved group in the new roster system a very difficult task.
- **Way forward:** Subcategorization of OBCs would be successful if the following conditions are met:
- » **Enumerate the OBC population** for objective sub-categorization.
 - Make the recommendations of Justice G Rohini committee public and let it be debated by various stakeholders.
 - Ensure transparency in criteria for subcategorization avoiding ambiguity in classification process.
 - » **Sensitize OBC communities** (including the dominant OBC communities) to make them aware of the need of sub-categorization.
 - » **Periodic review of subcategorization** to keep the list updated as per the changing socio-economic conditions of various groups.
 - » **Ensure effective implementation of OBC reservation** at all levels and take steps against the institutions not doing so.
 - » **Improve the roster system** to make sure SC/ST/OBC get the number of seats they are entitled to.
 - » **Establish legal and regulatory framework** which ensures effective implementation of subcategorization and makes available fast track grievance redressal

1) AGRICULTURE: PULSE PRODUCTION IN INDIA

- Example Questions:
 - » Discuss the significance of pulse production in India's agriculture system. Analyze the trend in the production of pulses in India and highlight the factors influencing these trends [15 marks, 250 words]
 - » Discuss the key strategies that can increase domestic production of pulses. [10 marks, 150 words]
 - » Examine the role of government policies and initiatives in the pattern of pulse production in India [10 marks, 250 words]
- Intro
 - » Pulses are the important source of proteins, vitamins and minerals and are popularly known as "Poor man's meat".
- Advantages Positives about Pulses
 - » **Nutritional Security:** In a country like India, where many people are poor and vegetarian, pulses are an important and affordable source of protein.
 - » **Suitable for Marginal Environment:** Drought resistant and deep rooting species of pulses can supply ground water to companion crops when planted in inter cropping pattern.
 - Locally adapted pulse varieties can enhance production system in dry environments.
 - » **Increase fertility of Land:** The leguminous plants of pulse also help in nitrogen fixation and thus ensuring higher fertility of soil.
 - » **Low food wastage footprint:** Pulses can be stored for longer period without losing their nutritional value and minimizing loss.
- Various pulses and production in India.
 - » India is the **largest producer** (25% of global production), **consumer** (27% of world consumption) and **importer (14%)** of pulses in the world.
 - They account for 20% of India's total area under cultivation and provide 7-10% of the total food grains in the country.
 - » **The overall pulse production in India** has gone up from 8.4 million tonnes in 1950-51 to 27 million tonnes in 2022-23.
 - In fact, in the last decade, India's production has increased by 50% (from 18 million tonnes to 27 million tonnes)
 - But, pulse production has not increased in step with the population growth, per capita availability of pulses have declined from 22.1 kg per person in 1951 to 16.4 kg per person in 2022.
 - Though there is surplus production of Chana, the imperfect substitution among pulses and limited international availability put pressure on the prices of some pulses.
 - » **Main Crops:**

- **Bengal Gram** (Desi Chick Pea/ Desi Channa), **Pigeon Peas** (Arhar/ Toor/ Red Gram), **Green Beans** (Moong Beans), **Chick Peas** (Kabuli Chana), **Black Matpe** (Urad / Mah / Black Gram), **Red Kidney Beans** (Rajma), **Black eyed Peas** (Lobiya), **Lentils** (Masoor), **White Peas** (Matar) are major pulses grown and consumed in India.
 - » **Rabi Crops (60% Production Share)**: Gram, Peas, lentil (masur), and black gram
 - » **Kharif Crops (40% Production Share)**: Arhar(tur), Moong and Urad etc.
 - » **Gram** (with 50% share) is the most dominant pulse produced and consumed in India. it is followed by **Tur/Arhar (15-20%)** and **Urad & Moong (8-10%)**.
 - **Note:** Experts say that Tur's consumption in meals as dal is much more than that of Chana. Chana is used more on account of its use in packaged food.
 - » **Gram** is the crop of subtropical areas. It is a rainfed crop.
 - » **Major Pulse Producing States**:
 - Madhya Pradesh, Maharashtra, Rajasthan, UP, and Karnataka.
- Primary reasons for domestic shortage of pulses and reduction in per capita availability of Pulses in India are:
- A. The increase in area under cultivation, production and productivity of pulses has been extremely slow.
 - » The production of pulses grew only by 45% from 1951 to 2008, while wheat production increased by 320% and rice by 230 percent. Therefore, for pulses India has been import dependent since 1981.
 - B. Low Yield, increased irrigation facilities and Blue Bulls trouble
 - » The yield of wheat is high (around 3,000 - 4,000 kg per ha) as against 750 Kg/ha of pulses.
 - In countries like France (4219 kg/ha), Canada (2000 kg/ha), USA (1882 kg/ha), China (1596 kg/ha) the per unit yield is much higher than that of India.
 - Lower yield is due to poor crop management, prevailing environmental conditions and better irrigation facilities.
 - » Hence with improve irrigation facilities farmers in north India (specially Uttar Pradesh) have slowly moved away from pulses.
 - » Cattles and blue bulls also preferred pulse crops leading to higher damages for pulse farmers.
 - C. Open ended procurement of wheat and rice under MSP -> Lack of assured price for pulse
 - D. Very less R&D on pulses globally (due to very less consumption in advanced western countries)
- Steps which have been taken to increase pulse production.
- A. Measures to incentivize Pulse Production under National Food Security Mission (NFSM), Minimum Support Price Programs and by Increase production.
 - For e.g., PM AASHA's prize support scheme specifically focused on increasing the procurement of pulses on MSP.
 - B. MoA&FW have also formulated a Special Kharif Strategy which was implemented during Kharif 2021:
 - Here, HYVs of seeds available with Central Seed Agencies or in the States were distributed free of cost to increase area under pule production through intercropping and sole crop.

C. **Crop Diversification Program** (a sub scheme of RKVY) is being implemented in original green revolution states viz. Punjab, Haryana, and in Western Uttar Pradesh to diversify paddy areas towards less water requiring crops like oil seeds, pulses, coarse cereals, agro forestry etc.

- **Way Forward:**

» **Augmenting domestic production**

- **Policy reforms** like higher MSP for pulses and inclusion of pulses under the PDS system.
- **Improved Agri-Inputs for Pulses:**
 - **Increased R&D** to focus on developing new HVYs which are adapted to drought, climate change etc.
 - **Promoting** cultivation of pulses in well irrigated areas and ensuring better irrigation facilities in existing pulse growing areas.
 - **Ensure timely availability of chemical fertilizers** which has remained a problem for this sector.
 - Similarly, inadequate availability of Gypsum or pyrites as a cheap source of sulphur remains a serious impediment in many states.
 - **Prioritizing the crop insurance scheme in pulse growing regions and its proper implementation**
- **Promoting Scientific Cultivation:** Currently, improper sowing time, low seed rate, defective sowing methods, insufficient irrigation etc. are the major agronomic constraints.

» **Focus on solution for blue bulls' trouble.**

- Biodiversity protection and conservation in forest areas could ensure enough availability of food for blue bulls in the forest areas and reduce their infiltration in cultivated areas.

» **Improving technology of Dal Mills -> Reduce wastage.**

- Most of the dal mills have outdated technologies, resulting in excessive loss of pulses in the form of broken or powdered grains.

» **Distribution channels** also have to be made more efficient.

» **Dealing with fluctuation of prices** - Increased buffer stocks and diversifying imports.

2) DISASTER MANAGEMENT: DAM SAFETY

- **Why in news?**

- » In Oct 2023, Sikkim's highest Dam (Teesta-III Dam at Chungthang) was washed away after an GLOF which raised doubts about hydropower projects being developed in the country (Oct 2023)
 - Various reports have since revealed that there were no EWS, no risk assessment or preventive measures in place as required under the 2021 Dam Safety Act.

- **Example Questions**

- » Discuss the key provisions of the Dam Safety Act 2021. How far does it go in ensuring structural and operational safety of dams [12.5 marks, 200 words]
- » What are the key concerns related to Dam Safety in India? How far will the Dam Safety Act, 2021 be able to resolve these concerns? [10 marks, 150 words]

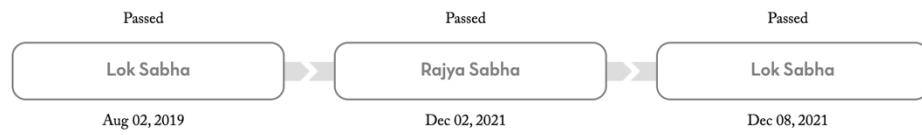
- **Introduction**

- » Dams are playing a very important role in the development of India. They not only supply water for irrigation, but also contribute in flood control and Energy generation (around 17% of India's total electricity).
 - » In terms of **number of Dams**, India stands third in the world with more than 6,000 large dams in operation and another 400+ large dams under construction. Further, India has thousands of medium and small dams.
 - However, a **poorly maintained and ill-operated dam** can become a source of threat not only for human life and infrastructure, but also for the environment. Therefore, there has been a long felt need of a **uniform law and administrative structure** in the country for the purpose of dam safety.
- **Key concerns associated with Dam Safety in India**
- » **Very Old Dams** - around 4% (227) of large dams are more than 100 years old and 80% are more than 25 years old.
 - » Many of these dams are located in earthquake prone zones.
 - » India has faced 36 major dam failure in the past, the worst one of Machchhu Dam (Gujarat) in 1979 in which about 2000 people had died.
 - » There are **varying degree of inadequacies** in meeting the current standards of dam health and safety.
 - **Poor Implementation** of the existing safety provisions
 - A report by CAG has found that
 - The structural strength of 348 large dams are suspect and they have not been inspected for over a decade.
 - Similarly, the **world bank report on Dam Rehabilitation and Improvement Project (DRIP)** indicates that the implementation of the program has been moderately unsatisfactorily.
- **Institutional Framework/Programs/Schemes dealing with dam safety in India**
- » **The Central Water Commission**, Ministry of Jal Shakti through the National Committee on Dam Safety (NCDS), NDSO, SDSCO etc has been making constant endeavours in the direction of Dam Safety.
 - » **Dam Rehabilitation and Improvement Project (DRIP)** is being implemented by Ministry of Jal Shakti with assistance from World Bank.
 - The main objectives of DRIP are:
 - a. TO improve the safety performance of selected existing dams (223 dams across 7 states) in a sustainable manner
 - b. To strengthen the dam safety institutional set up in participating states as well as at central level.
 - The seven DRIP states are - Uttarakhand, Madhya Pradesh, Jharkhand, Odisha, Karnataka, Kerala and TN.
 - » **The Dam Health & Rehabilitation Monitoring Application (DHARMA)**
 - It is a webtool/app which is focused on digitizing dam related data effectively. It will help in easy identification of vulnerable dams and ensure need based rehabilitation.

- » Ministry of Power and DRDO have signed an MoU for vulnerable Hydro Projects/ Power Stations in Hilly Areas

- Under this they would work jointly together towards developing suitable mitigation measures against avalanches, landslides, glaciers, glacial lakes, and other geo-hazards
- For vulnerable projects in hilly areas, expertise of DRDO will be used for developing comprehensive EWS.

- **Dam Safety Act, 2021**



- » The act is aimed at helping states and UTs to adopt uniform safety procedure and thus ensure safety of the dams. It also gives statutory backing to various dam safety institutions and provides for strict punishment in case of the violation of the law.
- » It provides for surveillance, inspection, and maintenance of all specified dams across the country.
 - These dams are with height more than 15 meters, or height between 10 meters to 15 meters but with certain design and structural principle.
 - The act establishes a robust Institutional Framework for Dam Safety:
 - It sets up **two national bodies**
 - i. **The National Committee on DAM SAFETY** which would evolve policies and recommend regulations regarding dam safety.
 - ii. **The National Dam Safety Authority** which would implement policies of the National Committee, provide technical assistance to State Dam Safety Organizations (SDSO) and resolve matters (dispute resolution) between SDSOs of states or between SDSOs and Dam Owners.
- » The law also sets up **two state bodies**
 - i. **State Committee on Dame Safety** which will review work of SDSO, order Dam Safety Investigation, recommend dam safety measures and review the progress of such measures.
 - ii. **State Dam Safety Organization (SDSO)** will be responsible for surveillance, inspection, monitoring, operation, maintenance and investigation of dams.
- » **Jurisdiction over dams**
 - All specified dams will fall under jurisdiction of the SDSO of the state in which dam is situated.
 - For dams owned by CPSU or which extends in two or more states or when a dam owned by one state is situated in other state, NDSA will have the jurisdiction and will play the role of SDSO.
- » **What are states required to do?**

- Provisions require states to classify dams based on hazard risk, conduct regular inspections, create emergency action plan, institute emergency flood warning systems, undertake safety reviews and period risk assessment studies.
 - » **Duties and Functions of DAM owners** (sufficient funds, trained manpower, dam safety units to conduct regular inspections, mandatory presence of engineers during floods and emergency, install emergency flood warning system; carry out risk assessment at regular intervals)
 - » **Comprehensive DAM Safety Evaluation (CSE)**
 - The act provides for comprehensive safety evaluation by independent panel of experts at regular intervals.
 - » **Offences and Penalties** for violation of provisions
- **Analysis of the act : Key challenges/Limitations**
- » **Jurisdiction of Parliament on the issue** (Entry 17 of the State List read with Entry 56 of the Union List, gives powers to state to make laws on water supply, irrigation and canals, drainage and embankments, storage etc for intra state rivers) .
 - » The **functions** of the NCDS, NDSA, SCDS are listed in the schedule of the act which can be modified by government through notification. Experts have raised concerns over this kind of overwhelming powers with central government.
 - » **States Raising Concerns** regarding NDSA having jurisdiction over dams owned by one state but situated in others. Some states feel that this takes away rights of states over their dams.
 - Note: TN own dams in the state of Kerala (in Mullaperiyar, Parambikulam, Tunakadavu, and Peruvanipallam)
 - » **States lack technical capability** to really implement the act in terms of number of trained personnel's, engineers etc.
 - The Sikkim GLOF reveals poor compliance at all levels of dam safety, from the dam's design to the spillway capacity.
 - » **Environment Impact ignored**
 - The act does not contain any norms which relates to environmental impact in the upstream and downstream of the rivers.
 - » **Lack of focus on operational safety** (like rate of filling or rate of water release) could lead to continuance of cases of Dam induced floods (e.g. Kerala floods, 2018)
- **Other problems related to Dam**
- » **Lack of coordination between states** leads to faulty management of dams.
 - For e.g., the recent floods in Odisha was caused by faulty management of Hirakud Dam. One of the reasons for it was lack of information from Chhattisgarh to Odisha regarding the flow of water.
- **Way forward**
- » **Set up the institutional framework envisaged under the law**
 - **Dam Safety Policy** should be finalized quickly to act as a guiding principle towards protection of Dams.
 - » **Promote More transparency:**

- Dam Safety is a public purpose and thus everything about dam safety, functions of institutions, their reports, decision minutes and agendas, everything should be promptly available to public.
 - » **Human Resource development:**
 - We will need huge human resource for ensuring that trained people man dams, engineers are available for inspection and monitoring, emergency action plan etc.
 - » **Land use plans** should have dam safety issues integrated in it.
 - » **Operational Safety and Environment Impact** needs to be better integrated in the act and any future policies.
 - » **Increased coordination between states:**
 - E.g. of the United States web-based integrated risk management tool called Dam Sector Analysis tool. The tool was developed using variables from dam failure models and decision support systems, which enables the software to project downstream risk in the case of a dam failure.
- **Conclusion:**
- » India's first prime minister, Pandit Jawaharlal Nehru, had referred to dams as the 'temples of modern India'. These temples would remain a boon, only if all the stakeholders work towards eliminating risks associated with Dam Safety.



CURRENT AFFAIRS PROGRAM

PRE-CUM-MAINS 2024

NOV 2023: BOOKLET-3

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1. GS-2

1) POLITY AND CONSTITUTION: PARLIAMENTARY PRIVILEGES

- **Why in news recently?**
 - » Parliamentary Privileges in case of defamation justified or not? [Nov 2023, Source: LiveLaw]
- **Introduction**
 - » Parliamentary privilege refers to **rights and immunities enjoyed by Parliament as an institution, MPs in their individual capacity and various committees**. These privileges ensure effective working of the Parliament and ensure authority, dignity and honour of the Parliament and its members.
 - » The Indian Constitution specifies the powers and privileges of Parliament in **Article 105** and those of State legislatures in **Article 194**. This includes
 - i. **Freedom of Speech** in Parliament subject to other provisions of the Constitution and standing order of the house (Article 105(1), 194(1)).
 - ii. **Immunity for all speeches and votes** in the parliament or any committee from **judicial scrutiny** (Article 105(2), 194(2))
 - **Immunity for persons publishing any report, paper, votes or proceeding by Parliament or under the authority of parliament.**
 - iii. **Powers and privileges and immunities of each house of the Parliament, and of the members and the committee of each house, shall be such as may from time to time be defined by Parliament by law.** (105(3), 194(3))
 - Until then it would have the same privilege as the British Parliament had in 1950.
 - This was amended by the **44th Constitutional Amendment Act**. It provided that other privileges of each house of Parliament, its committees and its members are to be those which they had on the date of commencement (i.e. 20th June 1979), until defined by Parliament.
 - Till now, parliament or state legislature have not passed any law to codify their privileges.
 - iv. The above immunities are also applicable to persons who by virtue of this constitution has the **right to speak in, or otherwise to take part in the proceedings of**, a House of Parliament or any committee thereof as they apply in relation to members of Parliament. (104(4), 194(4))
 - » **Note**
 - Article 194 is an **exact reproduction of Article 105** and it deals with the state legislatures and their members and committees.
 - **Two Types of Parliamentary Privileges**
 1. **Collective Privilege:**
 - The privileges, immunities **enjoyed by each house of the parliament collectively**
 - Right to publish its reports, debates and proceedings
 - Excluding strangers from its proceedings
 - Holding secret sittings

- To Punish members as well as outsiders for breach of its privileges or its contempt by reprimand, admonition or imprisonment (also suspension or expulsion, in case of members)
- The Courts are prohibited to enquire into proceedings of a House or its committees

2. Individual Privilege:

- In Civil cases, no arrest during the session of the house of 40 days before the beginning of the session and 40 days after end of the session
- **Freedom of Speech in Parliament.** No proceeding can be initiated against them in any court for anything said or any vote given in Parliament or its committees.
 - This freedom is subject to the provisions of the Constitution and to the rules and standing orders regulating the procedure of the Parliament.
- They are exempted from jury service.

- Need of Parliamentary Privileges

- » Enable each house of the legislature to discharge function properly and free of any pressure.
- » The members of highest deliberative body in the country and in each state should have freedom of speech to ensure all views (no matter how small, fringe or different) are being discussed.
- » Immunity from Judicial proceedings ensure non-interference by Judiciary in the parliamentary proceedings and separation of powers.
 - It further enhances the quality of deliberation in the house without worrying about Judicial interference.
- » These privileges ensure that undue influence, pressure or coercion is not brought on the legislature in the course of its functioning.

- What constitutes a breach of privilege?

- » A breach of privilege is a violation of any of the privilege of MPs/Parliament.
 - Among other things, any action 'casting reflections' on MPs, parliament or its committees; could be considered breach of privilege.
- » **No clearly laid out rules** on what constitutes breach of privilege and what punishment it entails.
 - This has led to a very high weightage being given to view of the members of the house.

- Sources of the Parliamentary Privilege

- » **Not codified yet**
- » They are based on following sources:
 1. Constitutional provisions
 2. Various laws made by Parliament
 3. Rules of Both the Houses
 4. Parliamentary Conventions
 5. Judicial Interpretations

- Cases of breach of privileges?

- » Several such cases.
 - In 1967, two people were held to be in contempt of Rajya Sabha, for having thrown leaflets from the visitors' gallery.

- In 1983, one person was held in breach for shouting slogans and throwing chappals from the visitor's gallery.
 - Sentenced to simple imprisonment
- » Similarly there are many cases on breach of privilege of state assemblies.
 - In June 2017, Karnataka Assembly speaker ordered the imprisonment of two journalists for a year based on recommendations in two separate reports of its privilege committee.

- **Criticism of Parliamentary Privileges:**

- » **Against Freedom of Speech**
 - Because of no codification it sometimes can be misused
 - For countering genuine criticism by individuals or media
 - » **Unlimited Powers:** No codification of provisions through a law has also led to parliamentarians getting unfettered powers to deal with cases.
 - » **Conflict of Interest:** It allows politicians to act as judge in their own cause, raising concerns of conflict of interest and violating basic fair trial guarantee.
 - » **Used for non-essential reasons:** Further, breach of privilege is invoked for the ostensible reason of protecting the image of the house on the whole or its individual members.
 - It should only be used when the functioning of the house is being obstructed.
 - » **Right to life and personal liberty violated**
 - Legislatures power to punish someone with imprisonment is questionable.
- Violation of the principle of separation of power** between legislature, executive and judiciary

- **Parliamentary Privilege vs Fundamental Rights**

- » In **MSM Sharma case 1959**, the Constitutional bench of the Supreme Court held that in case of conflict between fundamental right under Article 19(1)(a) and a privilege under Article 194(3) the latter would prevail.
- » In **Raja Ram Pal v Hon'ble Speaker, Lok Sabha and Ors. (2007)**, a constitutional bench of the Supreme court held that FR under article 20 and 21 could prevail over privileges under Article 105 and 194.

- **Supreme Court's jurisdiction**

- » Remain somewhat unclear
- » No rationale for Supreme court holding some FR superior and some subservient to parliamentary privileges.

- **Aug 2022 - Chairman of Rajya Sabha - Venkaiah Naidu said that MPs don't enjoy any immunity from being arrested in a criminal case during session or otherwise.**

- **Way Forward to prevent misuse**

- » **Codification** of privileges is the need of the hour -> Clearly define what privileges are:
 - Framers of constitution also envisaged codification of privileges through law.
- » Breach of privilege should be applied when there is a real obstruction of functioning of a house, and not in a way that sets legislator above ordinary comment and criticism.
- » Restrict the use of privilege to the proceeding of the legislature.
 - Members who are falsely accused of impropriety can use the defamation route through courts.

- » Another issue that has to be resolved is that whether the House should have the power to sentence a person to a jail term.
 - While the British parliament continues to have such powers, it has not used it since 1880.
 - Considering the Constitutional Bench's judgement in Raja Ram Pal case in 2007 where it said that privileges could be subordinate to Article 20 and 21, the legislative house shouldn't have the right to punish with imprisonment as it affects the Right to Life and Personal Liberty under Article 21.
- » Courts should also revisit their earlier judgment and find the right balance between Fundamental Rights of citizens and privilege of the legislature.
 - Considering that the privileges is subject to other provision of constitution, interpreting FR to be subordinate to parliamentary privileges can be reconsidered.

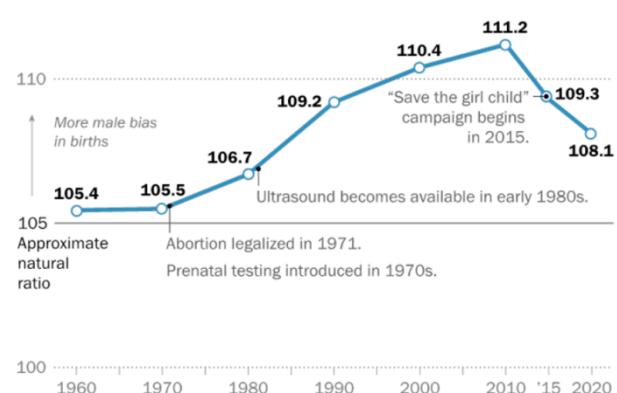
2) SOCIAL JUSTICE: SEX RATIO

- Why in news?
 - » International Day of the Girl Child was observed on 11th October with the theme 'Invest in Girls' Rights: Our Leadership, Our Well Being' (Oct 2023)
- Example Questions:
 - » Examine the effectiveness of government initiatives like Beti Bachao Beti Padhao in improving sex ratio in India. What are the key challenges in the implementation of these initiatives [15 marks, 250 words]
- Introduction:
 - » Gender Equality is a cornerstone of comprehensive socio-economic development. It reflects a society's commitment to fairness and inclusivity. The sex ratio of a country serves as a crucial yardstick to measure gender equality. It directly mirrors the status and well-being of women, serving as a barometer of societal attitudes towards women.
- Bad Situation of Sex Ratio in the past:
 - » As per the 2011 census, India's sex ratio was 940 females for every 1,000 males.
 - » Child Sex Ratio (CSR) was even more alarming at 914 (or 111 males for every 100 females) in 2011.
 - At least 9 million female births went "missing" between 2000 and 2019 because of female selecting abortions (as per a Pew analysis of various NFHS data and census data)
- Factors which led to poor sex Ratio:
 - » Social Factors: Patriarchal Social Norms - Son Preference (& Son-Meta Preference)
 1. **Patrilocality** (women having to move to husband's house after marriage)
 2. **Patrilineality** (property passing on to sons rather than daughters)
 3. **Dowry** (which leads to extra cost of having girls)
 4. **Old age support from sons**
 5. **Various rituals** performed by sons like last rites (lighting the funeral pyre and scattering their ashes).
 - » Technological Advancements:

- Beginning of use of pre-natal diagnostic tests and introduction of ultrasound technology in 1980s made it easy to determine sex of an unborn child.
 - Legalization of abortion (MTP Act, 1971) made situation worse.
- » **Administrative failure** - Poor implementation of laws/schemes/programs
- » **Lack of political will** - Flagship initiatives like BBBP were either missing or enough resources for the same were not allocated.
- **Negative Social Impact:**
 - » Societies with high rates of sex-selective abortions typically suffer within a couple of decades from a shortage of marriageable women, and a surplus of men seeking brides. This "marriage squeeze" can trigger a variety of social problems, such as increase in sex related violence, trafficking of women etc.
- **Steps taken to improve Child Sex Ratio:**
 - » **About Beti Bachao Beti Padhao (BBBP)**
 - Launched in 2015, it is a comprehensive program to address the declining **Child Sex Ratio (CSR)** and related issues to empowerment of women over a life-cycle continuum.
 - » **Sukanya Samruddhi Account Scheme**
 - Under these accounts of girls could be opened from the time of their birth till their attaining the age of 10. The account can be opened with an amount of Rs 1000 and in a financial year, a sum of up to Rs. 1.5 Lakh can be deposited in it. Investments made under the scheme will also be eligible for exemption under 80C of Income Tax Act, 1961.
 - » **Observation of National Girl Child Day on 24th Jan** since 2008 by MoW&CD. It focuses on increasing awareness; ensuring human rights for girls; increasing awareness about gender inequality; and addressing girl child issues.
 - » **Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, 1994** prohibits sex selective practices.
- **Improvement in Situation:**
 - » As per the NFHS-5 (2019-21) the CSR at Birth is at 929 (or 108 males for every 100 females). It is a glimmer of hope and suggests that Indian families are less likely to use abortions to ensure birth of sons rather than daughters.
- **But this isn't good enough:**
 - » The Child Ratio at Birth (CRB), at 929 as per NFHS-5, is below the WHO's natural ratio at birth (952). This indicates that despite advancements, India is yet to reach the desired gender parity.

India's sex ratio at birth has been moving toward balance in recent years

Sex ratio at birth, or the number of male births per 100 female births
115



- **Way Forward:**

» **Improving Implementation of Schemes BBBP:**

- As per the Parliamentary Committee led by Heena Vijaykumar Gavit:
 - Around 80% money spent on BBBP have been spent on media campaigns and advocacy alone.
 - Huge spending on national level media campaigns for the scheme was a clear violation of the INR 50 lakh provision earmarked for each district under the scheme for six different components consisting of innovation and awareness building, intersectoral consultation and capacity building, monitoring evaluation, and interventions of health and education.
 - Over all utilization of funds was below par. Only 25% of the allocated budget was utilized.
 - A 2017 CAG report also highlighted various issues with BBBP including infrequent meetings, underutilization of funds and non-compliance with the guidelines.
 - Beti Padhao component is also facing challenges due to dual burden of care responsibilities; unavailability of clean functioning toilets; lack of commuting options etc.

» **Comprehensive Strategies for gender equality should encompass a multifaceted approach:**

- **Focus on districts and prioritize cities** with low sex ratios.
- **Promoting Awareness** - through discussion, conference, and debates
- **Engage Local Communities** in the development and growth of girl children - it will foster a sense of collective responsibility and action.
- **Empower local governing bodies and community groups** to act as catalyst for social change at the grassroot level ensuring sustainable progress, as they can tailor strategies to their community's unique needs, making the efforts more effective and relevant.

» **Focus on comprehensive women empowerment:**

- **Legal Reforms** - Ensuring gender sensitive legislations, promoting economic empowerment, and ensuring property and inheritance rights for women.
- **Educational Reforms** - Implementing gender sensitive education policies. This includes curricula that challenges stereotypes, fosters safe and inclusive school environments, and providing scholarships and incentives to encourage girls' participation in education.
- **Creating Public Awareness and cultural change**: Regulating media and advertising, engaging communities to challenge harmful practices and involving men and boys as allies in the fight for gender equality can drive societal change.

- **Conclusion1:**

- » The above initiatives are integral to broader national efforts to promote gender equality and empower women and girls, setting a course for a more inclusive and equitable society where all genders have equal opportunities and rights.

- **Conclusion1:**

- » Pursuing gender equality in India is an ongoing journey marked by progress and persistent challenges that need to be continuously addressed.

3) SOCIAL JUSTICE: PVTGS

- **Why in news?**
 - » PM Modi launches Rs 24,000-crores scheme for vulnerable tribal groups (Nov 2023)
- **Example Questions**
 1. Who are Particularly Vulnerable Tribal Groups (PVTGs)? Throw some light on the socio-economic condition of these groups.
 2. Discuss the main limitations of the government schemes focusing on PVTGs. Suggest a few remedies to deal with these limitations.
- **Introduction**
 - » **Particularly vulnerable tribal group (PVTG)** (earlier: Primitive tribal group) is a **government of India classification** created with the purpose of enabling improvement in the conditions of certain communities with particularly low development indices
 - » The **Dhebar Commission (1960-1961)** stated that within Scheduled Tribes there existed an inequality in the rate of development. In 1973, during the fourth Five Year Plan a sub-category was created within Scheduled Tribes to identify groups that considered being at a lower level of development.
 - » Till now, 75 tribal groups have been categorized by Ministry of Home Affairs as PVTGs. They reside in 18 states and UT of A&N Islands.
- These groups are **characterized by**
 - » A pre-agriculture level of technology
 - » Stagnant and declining population
 - » Extremely low literacy
 - » Subsistence level of economy
- **Government Initiatives:**
 - i. **PM-PVTG Development Mission**
 - First announced in the 2023-24 budget, the scheme was launched by PM Modi in Nov 2023 from Jharkhand's Khunti district on the occasion of tribal icon Birsa Munda's birth anniversary and the third Janjatiya Gaurav Divas.
 - It has a budgetary allocation of Rs 24,000 crores and is dedicated to the holistic development of all 75 PVTGs living in 22,000+ villages of 18 states and UTs..
 - The **objective** of the scheme is to improve the socio-economic conditions of PVTGs by providing basic facilities like road and telecom connectivity, electricity, housing, clean water, sanitation, improved education, healthcare, nutrition, and sustainable livelihood to PVTG families and habitations.
 - This is an umbrella initiative under which 9 ministries will implement 11 interventions, including PMGSY, PMAY(G), Jal Jeevan Yojna etc.
 - **Note:** MoTA is the nodal ministry for overall policy planning and coordination.
 - ii. **Scheme for Development of PVTGs**
 - It is a central sector scheme launched in 2008 by MoTA exclusively for PVTGs.
 - **Flexibility to state:** Under the scheme, Conservation cum development (CCD)/Annual Plans are to be prepared by each state/UT for their PVTGs based on their need

assessment, which are then appraised and approved by the Project Appraisal committee of the Tribal Ministry.

- Activities for development are taken in the fields of education, health, livelihood and skill development, agriculture development, housing & habitat, conservation and culture etc.

- **Current Situation of PVTGs in India: Report by Anthropological Survey of India (AnSI) about PVTGs (April, 2017)**

- » **Report:** The Particularly Vulnerable Tribal Groups of India - Privileges and Predicaments
- » **Key Findings**

- a. **Baseline surveys** exists for only 40 groups out of 75 PVTGs -> **displays government's apathy** towards PVTGs
 - Baseline surveys are done to precisely identify PVTG families, their habitat and socio-economic status, so that development initiatives are implemented for these communities, based on the facts and figures.
- b. **Regional and state specific variations in welfare schemes for PVTGs**
 - For instance, Odisha has established exclusive micro-projects for PVTGs, there are none such in for the five PVTGs in Gujarat.
 - **Unequal treatment in same state:** In some cases, a PVTG receives benefits only in a few blocks in a district, while the same group is deprived in adjacent blocks. The reason is that micro-projects extend benefits only within their jurisdiction.
- c. **State wise distribution**
 - Among the 75 listed PVTGs the highest number are found in Odisha (13).
 - Other states
 - Bihar including Jharkhand (9), MP including Chhattisgarh (7), Tamil Nadu (6), Kerala (5), Gujarat (5), WB (3), MHA (3), Kar (2), UK (2), Rajasthan (1), Tripura (1), Manipur (1).
 - All four Tribal groups in Andaman and 1 in Nicobar Islands are recognized as PVTGs.
- d. **Huge Variation in the number of PVTGs**
 - A few individuals as in case of Great Andamanese (57), Onge(107) and Sentinelese (around 50) to more than 4 lakh population of Sahariyas in MP and Rajasthan.
- e. **Literacy rate going up**
 - Literacy rate has gone up significantly over the past.
 - From a single digit, the literacy rate has gone upto 30-40% in some PVTGs.
 - **Female literacy rate** is still considerably lower compared to male counterparts.
- f. **Considerable increase in age of marriage among PVTGs**
 - The incidence of girl child being married while still being a minor, among these tribes have been decreasing.

- **Recommendations of the report**

a. **Urgently conduct baseline surveys**

- State governments should urgently conduct baseline surveys of the PVTGs to arrive at accurate demographic and socio-economic figures of the PVTGs.

b. **Revise and refine PVTG list to avoid overlapping and repetition.**

- For instance, the list contains the synonyms of the same group such as the Mankidia and the Birhor in Odisha, both of which refers to the same group.
- Some of the PVTGs are counted in more than 1 states, and the report suggests that the total number of PVTGs should be 63.

- **Conclusion / Way forward for PVTGs**

» **Better identification of Problems:**

- **Implement the recommendations of AnSI and PM-PVTG Mission** effectively.

» **Common Development Agency** to focus on PVTGs in case of inter-state distribution of the group.

» **Customized development Plans** for PVTGs, considering their distinct cultural practices, traditional knowledge etc.

» **Critical time bound monitoring and evaluation** of various projects and schemes is important for the economic upliftment of PVTGs.

» **Bottom-up approach** rather than existing top down approach for their development -> empowering local bodies to ensure better focus on PVTGs.

- **Conclusion:**

» Effective implementation schemes like PM-PVTG mission to the unique need of PVTG can contribute significantly to the overall development and welfare of PVTGs.

A) PRELIMS: PVTGS IN VARIOUS STATES

State / UT Name	PVTGs Name
Andhra Pradesh and Telangana	1. Bodo Gadaba 2. Bondo Poraja 3. Chenchu 4. Dongria Khond 5. Gutob Gadaba 6. Khond Poroja 7. Kolam 8. Kondareddis 9. Konda Savaras 10. Kutia Khond 11. Parengi Poroja 12. Thoti
Bihar and Jharkhand	13. Asurs 14. Birhor 15. Birjia 16. Hill Kharia 17. Konvas 18. Mal Paharia 19. Parhaiyas 20. Sauda Paharia 21. Savar
Jharkhand	Same as above
Gujarat	22. Kathodi 23. Kohvalia 24. Padhar 25. Siddi 26. Kolgha
Karnataka	27. Jenu Kuruba 28. Koraga
Kerala	29. Cholanaikayan (a section of Kattunaickans) 30. Kadar 31. Kattunayakan 32. Kurumbas 33. Koraga
Madhya Pradesh and Chhattisgarh	34. Abujh Macias 35. Baigas 36. Bharias 37. Hill Korbas 38. Kamars 39. Saharias 40. Birhor
Chhattisgarh	Same as above
Maharashtra	41. Katkaria (Kathodia) 42. Kolam 43. Maria Gond
Manipur	44. Marram Nagas
Odisha	45. Birhor 46. Bondo 47. Didayi 48. Dongria-Khond 49. Juangs 50. Kharias 51. Kutia Kondh 52. Lanjia Sauras 53. Lodhas 54. Mankidias 55. Paudi Bhuyans 56. Soura 57. Chuktia Bhunjia
Rajasthan	58. Seharias
Tamil Nadu	59. Kattu Nayakans 60. Kotas 61. Kurumbas 62. Irulas 63. Paniyans 64. Todas
Tripura	65. Reangs
Uttar Pradesh and Uttarakhand	66. Buxas 67. Rajis
West Bengal	68. Birhor 69. Lodhas 70. Totos
Andaman & Nicobar Islands	71. Great Andamanese 72. Jarawas 73. Onges 74. Sentinelese 75. Shorn Pens

4) IR: INDIA-QATAR

B) PRELIMS FACTS ABOUT QATAR

Location:

- » **Qatar** officially, the state of Qatar is a sovereign country located in Southwest Asia, occupying a small Qatar peninsula on the north eastern coast of the Arabian Peninsula.
- » **Land border** is only shared with Saudi Arabia in the south, while the rest of its territory surrounded by the Persian Gulf.
- » **A strait in Persian Gulf** separates Qatar from the nearby island of Bahrain.



History:

- » Following Ottoman empire, Qatar became British protectorate in the early 20th century until gaining Independence in 1971.

Capital: Doha

High Income Economy

- » Developed country, backed by world's third largest natural gas reserves (after Russia and Iran) and oil reserves.
- » One of the highest per capita incomes in the world.
- » Most advanced Arab state for human development.

Middle Power: In the 21st century, the country has emerged as a middle power in the Arab world through its resource-wealth, as well as its globally expanding media group, Al Jazeera network.

Total Population

- » 2.6 million
 - Around 3 lakh Qatari
 - 23 lakh expatriates
 - Around 8 Lakh.

C) INDIA-QATAR RELATIONS

- **Practice Question:**
 - » Discuss the key pillars of India-Qatar bilateral relations [10 marks, 150 words]
- India Qatar relations have generally remained very steady:

- » **Large Indian Diaspora:** About 8 lakh Indian nationals work and live in this small country.
 - » **Close Economic Ties:**
 - **India's Energy Dependency:** Qatar is the largest supplier of LNG to India (10.74 million tonnes in FY23), accounting for 54% of India's LNG imports. India also imports ethylene, propylene, ammonia, urea, LPG etc from Qatar.
 - » LNG imports are expected to increase in future as India has set a target of increasing the share of natural gas in the primary energy mix to 15% by 2030 from a little more than 6% at present.
 - » While Indian LNG importers - predominantly the public sector oil and gas companies - continue to make efforts to diversify sourcing, it could be years before the high reliance on Qatar can be reduced to a meaningful extent.
 - **Bilateral Trade:**
 - » **India's total import** from Qatar in FY23 were valued at \$16.81 billions of which 50% was that of LNG imports.
 - » **India's exports** to Qatar were valued at just \$1.97 billion in FY23.
 - The major exports include cereals, vegetables, fruits, spices, processed food, copper articles and iron & steel.
 - **Investments** by Qatar Investment Authority is substantial in India's new economy.
 - » Major Qatari investments since 2019 include investments in Airtel's AirtelAfrica, Byju's, Adani Transmission Ltd, Adani Green Energy, Reliance Retail Ventures Limited, Swiggy, Allen Career Institute etc.
 - » **Strong Political Ties:**
 - There have been high-level visits in recent years, with PM Modi visiting Qatar in 2016, and the Emir of Qatar, Sheikh Tamim bin Hamad Al Thani, paying a state visit to India in March 2015.
 - Further, EAM S Jaishankar has visited Doha multiple times.
 - Even when Qatar was isolated and feeling the heat of Saudi-led blockade in 2017-2021, India continued its economic engagement with Doha.
 - » **Defence Cooperation** is an important pillar of the bilateral agenda.
 - India-Qatar Defence Cooperation Agreement signed in 2008, was further extended for a period of five years in 2018.
 - India offers training slots in its defence institutions to a number of partner countries, including Qatar.
 - India also regularly participates in the biennial Doha International Maritime Defence Exhibition and Conference (DIMDEX) in Qatar.
 - Indian Naval and coastguard ships regularly visit Qatar as part of bilateral cooperation and interaction.
 - » **Cooperation during COVID-19:**
 - During the pandemic, India and Qatar collaborated on many fronts including repatriation efforts for stranded citizens and sharing experiences on managing the crisis.
- **Source of tension (Key differences) which impact India-Qatar relations:**

- » India and Qatar don't have converging views on the situation in West Asia.
 - For e.g.
 - India's improved relation with Saudi-Arabia and Qatar's poor relation with Saudi Arabia led group.
 - India is sometimes seen to be abandoning its commitment to the Palestinian cause.
 - » Qatar is a bastion of Islamic conservatism.
- **Former Indian Navy Personnel Getting Death Penalty (Oct 2023)**
 - » **Basic Details of the case?**
 - The Indian Nationals were employed by the Al Dahra company in Doha. The company was involved in producing high-tech Italian origin submarines that are known for stealth capabilities.
 - These Indians were involved in imparting training to Qatar armed forces officers.
 - They were arrested in 2022 and trials were held in March and June 2023. They were provided consular access on multiple occasion by India. Eventually, they were given death penalty by a local court on 26th Oct 2023.
 - According to a report by Financial Times, the eight Indians had been charged with spying for Israel. But this has been disputed, and it has been asserted that there is no ongoing submarine contract and no Israeli connection.
 - » **India's Response:**
 - Gol has expressed shock and is exploring all consular and legal assistance in the matter.
 - » **How could India-Qatar relation get affected?**
 - The verdict is the first major crisis to hit the India-Qatar relations. Given the situation with India's energy security concerns and ambitions, the case of the retired Navy Personnel presents a sensitive challenge for India's diplomacy.
 - Further, **timing of the judgment** is another issue. Right now, West Asia is going through turmoil and polarized situation due to Israel-Palestine war.
- **Way Forward: Deft Diplomacy:**
 - » **Legal Option:**
 - Appeal in higher Court
 - » **Mercy Petition** to Emir of Qatar who is known to pardon people during Ramadan and Eid.
 - » **Political and Diplomatic Option:**
 - "Epsilonage issues are determined not only by judicial verdicts but also by the nature of relations between states": Former diplomat Vivek Katju
 - Delhi should work with various levers with Qatari establishments - Political, Economic, Defence and Indian Community.
 - Use the help of influential Indian Community members to work the levers in the Qatar establishment.
- **Conclusion:**
 - » This is a challenging diplomatic issue that requires careful consideration and strategic action.
 - » India's response should consider the implications of the Vienna Convention on Consular Relations, international precedents, and the broader context of India-Qatar relations.

- » Weather through diplomatic dialogues, political interventions, legal appeals, or a blend of these strategies, India has the potential to seek a resolution.

2. GS-3

1) S&T: DEEPFAKE

- **Why in news?**
 - » PM Modi warns against deepfakes, calls on media to educate people on misinformation (Nov 2023)
 - » Following the controversy created by Deepfake videos of actress Rashmika Mandanna and Katrina Kaif's deepfakes being circulated online, the GoI has asked social media companies to remove deepfake within 36 hours of a complaint being registered (Nov 2023)
- **Example Questions:**
 - » Examine various risks associated with the malicious use of deepfake technology. Suggest measures to regulate and manage those risks [15 marks, 250 words]
- **Example Video-1:** https://youtu.be/3wVpVH0Wa6E?si=A2VSJMF97nATm8_y
- **Basics:** Deepfakes refer to manipulated media (audio, video, images etc) created using a form of Artificial intelligence called Deep Learning (or Deep Neural Network). This manipulated content use lip syncing, swapping of face etc. – mostly without consent.
- **How does the Deepfake technology work?**
 - » The technology involves modifying or creating images or videos using a machine learning technique called **Generative Adversarial Network (GAN)**. The AI driven software detects and learns the subjects' movements and facial expressions from the source material and then duplicates this in another video or image.
 - » **Larger the source material used**, better will be the quality of deepfake. Therefore, highest number of deepfakes are made of public figures like politicians and film stars.
 - » **Through a collaborative work of two softwares**, the fake video is rendered until the second software package can no longer detect the forgery. This is known as "unsupervised learning" when machine language models teach themselves. The method makes it difficult for other software to identify deepfakes.
- **Advantages:**
 - » Synthetic Media/ Deepfakes can create **possibilities and opportunities for all** people, regardless of how people listen, speak, or communicate. It can give people voice, purpose, and ability to make an impact at scale and with speed.
 - » It has been used by the ALS association in collaboration with a company to use voice cloning technology to help people with ALS digitally recreate their voices in future.
- **Concerns:**

- » Like most new technologies, it can also be **weaponized to inflict harm** to individuals, institutions, businesses or a country.
 - » **Crime against women** can increase with malicious use of Deepfakes in pornography and can inflict emotional, reputational and in some cases violent outcome for some individuals. (for e.g. viral deepfake video of actress Rashmika Mandana incident)
 - » **Endanger Social Harmony** – Communal/caste-based statements.
 - » **Decrease trust towards institutions like government/media** – by propagating false propaganda against them.
 - » **Undermine democracy and impair diplomacy** – false information about institutions, public policy, and politicians powered by a Deepfakes can be exploited to spin the story and manipulate belief.
- **How to spot/identify a deepfake?**
- » Look for **unnatural blinking or lack of it**.
 - » **Lighting** that just don't sit right.
 - » Sometimes, **voice could be too robotic**.
 - » If the video sounds **too sensational to be true**, trust your gut.
 - » Voices that miss the mark on lip synchronization
- **Recent Advisory released by Ministry of electronics and Information Technology:**
- » **IT Rules, 2021** require that **all content reported to be fake or produced using deepfake be taken down by intermediary platforms within 36 hours**.
 - » An advisory was sent to social media platforms in Nov 2023, reminding them that they may **lose “safe harbour immunity”** under the IT Act, if they fail to remove within 36 hours deepfake content that has been reported.
- **Way Forward:** To defend the truth and secure freedom of expression, we need a **multi-stakeholder and multi-modal approach**. **Collaborative actions and collective techniques** across **legal reforms, social media regulation, media literacy, and technology intervention** can provide effective and ethical countermeasures to mitigate the threat of malicious Deepfakes.
- » **Legislative Reforms:**
 - IT Act needs **stronger provisions to Curb Deepfake menace**. Currently **IT Act and IPC** only partially address the harms which arise from deep fakes.
 - There is also need of a **law on AI to govern the complexities relating to AI** and related applications.
 - » **Consumer awareness and Media Literacy** by Consumers and Journalists will be the key to fighting Deepfakes. Media literacy efforts should be enhanced to **cultivate a discerning public**. A consumer should have the ability to **decipher, translate, understand and use the information we encounter**.
 - » **Technological intervention** with easy to use and **accessible technology solutions to detect Deepfakes, authenticate media, and amplify authoritative sources** will be crucial in fighting Deepfakes.
 - » **International Collaboration:** To explore **content labelling solutions or watermarking of AI-generated content**.

3. PRELIMS FACTS

1) MAPPING: TUVALU

Tuvalu is a country in **West Central-Pacific Ocean**. It is composed of **9 coral islands** scattered in chain lying approximately northwest to southeast.

History: Together with what is now **Kiribati** (formerly the Gilbert Islands), Tuvalu formed the **British Gilbert and Ellice Islands Colony** before separately gaining its **independence in 1978**.

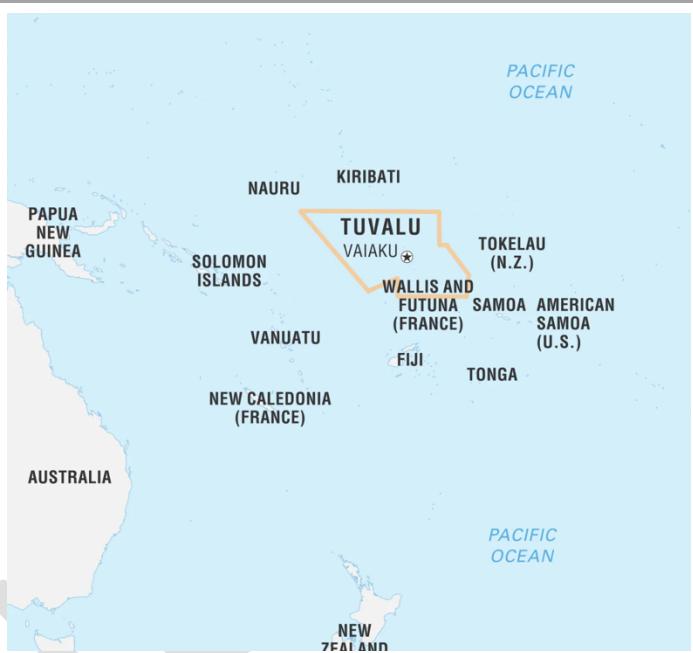
De facto capital: **Vaiaku**. This is where **most of the government offices are located**.

Geography:

- The islands are **low-lying**, most being **13 to 16 feet** above sea level.
- No Rivers:** Rain catchment and wells are sources of fresh water.

Recent Developments: Australia Offers Climate Refuge to Tuvalu Citizens (Nov 2023)

- A new **treaty** - known as the **Australia-Tuvalu Falepili Union Treaty** - is the most significant agreement between Australia and Tuvalu.
 - It promises **Australian assistance** to the nation on **climate action** and **security**.
 - Under this **Australia will provide migration pathways** for people from Tuvalu facing the existential threat of climate change. It is the **world's first bilateral agreement on climate mobility**.
 - Under the treaty, **Australia will implement special visa agreement** to allow **Tuvaluans to work, study and live in Australia**. This is **not a refugee visa**, but rather will allow **upto 280 Tuvaluans** (from a population of around 11,200) to migrate to Australia each year - presumably on a **permanent basis**. This will provide people with **both legal and psychological security**.



2) MAPPING: CONGO RIVER AND CONGO RIVER BASIN

Congo River was formerly also known as the **Zaire River**.

It is the **second longest (4,700 km) river of Africa** (9th longest of the world) (the longest is Nile).

It is also the **world's third largest river in terms of discharge volume** after Amazon and Ganges.

It is also the **world's deepest recorded river**, with measured depth of around **220 m**.

Important Tributary: The **Chambeshi** is a **tributary of the Lualaba River** (which is the name of the Congo river upstream of Boyoma Falls).

Crosses equator twice: It is the **only major river of the world to cross equator twice**.

The river and its tributaries **flow through the Congo Rainforest**, the second largest rainforest area in the world, **after the Amazon Rain Forest**.

Congo River Basin: It is the world's **second largest river basin** (after Amazon river), comprising an area of **3.4 million square kms**



Basin countries include: DRC, Republic of Congo, parts of Gabon, Part of Cameroon, Central African Republic, Rwanda, Burundi, parts of Tanzania, Western Zambia, northern Angola.

3) MAPPING: PLACES IN NEWS: DEMOCRATIC REPUBLIC OF CONGO (DRC)

It is a country located in Central Africa and equator passes through northern part of the country giving it a tropical climate.

It has a **small 40 km coastline**, otherwise it is landlocked.

DRC is the **second largest country** in the Africa (after Algeria).

Capital: Kinshasa (located on Congo river), is the largest city of the DRC and also its **administrative, economic and cultural centre**.

DRC gained **independence from Belgium in 1960** and from **1971 to 1997** the country was **officially called the**



Neighbouring Countries: Republic of Congo (Brazzaville); Central African Republic; South Sudan; Uganda; Rwanda; Burundi; Tanzania (Separated by Lake Tanganyika), Zambia and Angola.

Republic of Zaire, a change made by then ruler Gen. Mobutu Sese Seko to give the country what he thought was a more authentic African name. "Zaire" is a variation of a term meaning "great river" in local African languages; Following the overthrow of Mobutu in 1997, the country's name prior to 1971, the DRC, was reinstated.

Lake Tanganyika: It is the longest freshwater lake in the world and the second deepest (after Lake Baikal of Russia). It forms boundary between DRC-Burundi and part of boundary between DRC-Tanzania.

Most of the country is composed of the Central Congo Basin.

Congo Basin Rain Forest: The country consist of significant portion of the Congo Basin rain forest often known as the "second lung of the Earth".

4) MAPPING: ETHNIC CONFLICT IN CONGO

Background of Conflict in DRC?

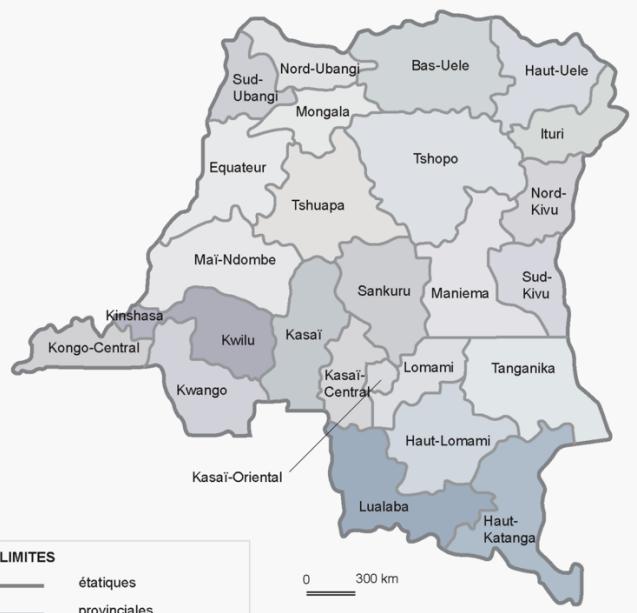
Rwandan Genocide in 1994: Ethnic Hutu extremists killed nearly 1 million minority ethnic Tutsis and non-extremist Hutus.

Since then, the eastern part of DRC, bordering Rwanda, has been facing insurgency perpetrated by several rebel militant groups. According to the UN, more than 120 insurgent groups are active in eastern provinces of Ituri, North Kivu, South Kivu, and Tanganyika.

Tutsi led M23 Rebel Group: The Tutsi led M-23 rebel group resurfaced in Nov 2021 and has worsened the security situation in the eastern provinces of DRC. After failure of various peace attempts, the groups have kept on advancing since Jan 2023. DRC accused Rwanda of supporting Tutsi group.

Prominent Rebel Groups:

- The prominent groups besides M23 include the Allied Democratic Force (ADF), the Cooperative for Development of the Congo (CODECO).
- ADF is an Uganda based insurgent groups and is operating since 1999. It has also pledged its allegiance to ISIS.



Provinces of DRC

Why insurgency?

- **Ethnic Intolerance**: Following the Rwandan genocide, around 2 million Hutu refugees crossed Rwanda into North Kivu and South Kivu provinces of DRC. The organized ethnic militias in DRC fearing persecution.
 - Tensions intensified as Rwandan Tutsis organized militias against the Hutus who fled to DRC.
 - Subsequently several, ethnic and inter-ethnic groups who felt threatened

- **CODECO** claims that they aim to protect the ethnic Lendu against the Hemas and the Congo army.

Impacts of Insurgency:

- Thousands are dead.
- **Huge Internal Displacement:** In Oct 2023, the UN International Organization on Migration (IOM) reported that the number of people who have been internally displaced in the DRC has risen to 6.9 million.
- In the eastern province of Kivu, nearly a million people have been displaced due to the ongoing conflict with the rebel group, **Mouvement du 23 Mars** (M23)

started organizing their militias against each other.

- **Political Instability:** President Felix Tshisekedi came to power in 2019 through democratic elections. The country is to hold elections on 20th Dec. However, election commission has raised concerns about how continuing insecurity in parts of the country would pose a challenge to a "free democratic and transparent" vote.
- **Control over territory and natural resources**
- Extrajudicial killings by security forces
- **Rising tensions with neighbouring countries** (Armed groups have been supported by the governments of **Rwanda, Uganda and Burundi**, at various points, acting as proxies for each country's interest in the region)

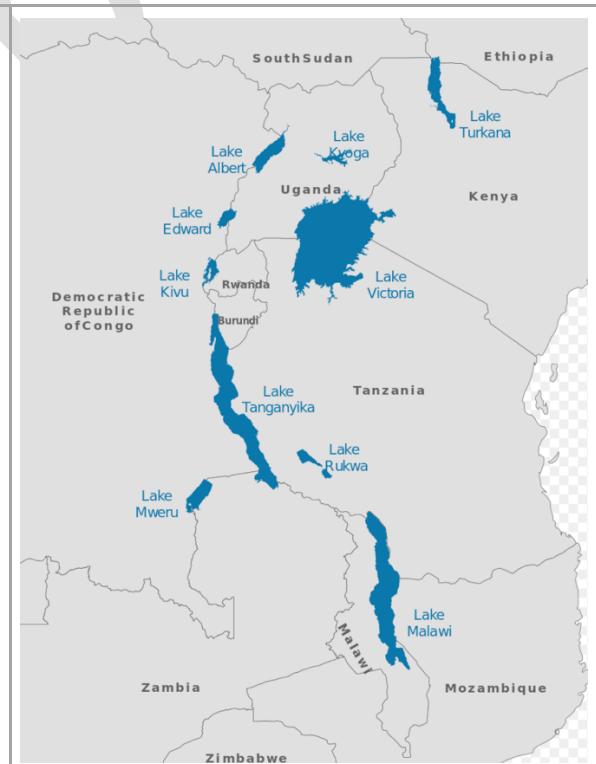
5) MAPPING: LAKE TANGANYIKA

Lake Tanganyika is one of the African Great Lakes. It is the world's longest lake.

It is second-oldest freshwater lake in the world, the second largest by volume, and the second deepest in the world, in all cases after Lake Baikal in Siberia.

The lake is shared between four countries - DRC(40%), Burundi, Tanzania (46%) and Zambia.

The lake drains into the Congo River system and ultimately into the Atlantic Ocean.



6) MAPPING: PLACES IN NEWS: KAMCHATKA PENINSULA

Kamchatka peninsula is a peninsula in the Russian Far East, with an area of about 2.7 lakh km². It is sparsely populated.