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03

Ranks in
Top 10

12

Ranks in
Top 25

25

Ranks in
Top 50



RANK 01

Shruti Sharma



RANK 5

Utkarsh Dwivedi



RANK 6

Yaksh Chaudhary



RANK 12

Yasharth Shekhar



RANK 13

Priyamvada
Mhaddalkar



RANK 14

Abhinav Jain



RANK 15

Challapalle
Yaswanthkumarreddy



RANK 16

Anshu Priya



RANK 19

Diksha Joshi



RANK 20

Arpit Chauhan



RANK 21

Dilip Kainikkara



RANK 25

Shruti Rajiakshmi



RANK 29

Bhavishya



RANK 31

Avinash V



RANK 33

Jaspinder Singh



RANK 35

Kartikeya Jaiswal



RANK 37

V Sanjana Simha



RANK 40

Kushal Jain



RANK 44

Anjali Shrotriya



RANK 47

Naman Kumar
Singla



RANK 50

Abhijit Ray

Outstanding performance by BYJU'S students in IAS 2020

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02

Ranks in
Top 10

18

Ranks in
Top 50

36

Ranks in
Top 100



RANK 02

Jagrati Awasthi



RANK 8

Kartik Jivani



RANK 13

Gaurav Budania



RANK 14

Karishma Nair



RANK 17

Sarthak Agarwal



RANK 25

Vaibhav Rawat



RANK 26

Pulkit Singh



RANK 28

Divya Mishra



RANK 30

Divyanshu
Choudhary



RANK 31

Megha Swaroop



RANK 32

Rallapalli Jagat Sai



RANK 35

Aparna Ramesh



RANK 37

Narwade Vinayak



RANK 38

Varuna Agarwal



RANK 41

Aswathy Jiji



RANK 42

Pooja Gupta



RANK 46

Jubin Mohapatra



RANK 50

Abhishek Shukla

Incredible Results

CSE 2019

4 Ranks
in top 10

13 Ranks
in top 50

22 Ranks
in top 100



Rank 3
Pratibha Verma



Rank 6
Vishakha Yadav



Rank 8
Abhishek Saraf



Rank 10
Sanjita Mohapatra

CSE 2018

11 Ranks
in top 50

28 Ranks
in top 100

183 Ranks
in the final list



Rank 11
Pujya Priyadarshni



Rank 16
Dhodmise Trupti Ankush



Rank 21
Rahul Jain



Rank 24
Anuraj Jain



Rank 31
Mainak Ghosh

CSE 2017

5 Ranks
in top 50

34 Ranks
in top 100

236 Ranks
in the final list



Rank 3
Sachin Gupta



Rank 6
Koya Sree Harsha



Rank 8
Anubhav Singh



Rank 9
Soumya Sharma



Rank 10
Abhishek Surana

CSE 2016

8 Ranks
in top 50

18 Ranks
in top 100

215 Ranks
in the final list



Rank 2
Anmol Sher Singh Bedi



Rank 5
Abhilash Mishra



Rank 12
Tejaswi Rana



Rank 30
Prabhash Kumar



Rank 32
Avdhesh Meena

CSE 2015

5 Ranks
in top 50

14 Ranks
in top 100

162 Ranks
in the final list



Rank 20
Vipin Garg



Rank 24
Khumanthem Diana Devi



Rank 25
Chandra Mohan Garg



Rank 27
Pulkit Garg



Rank 47
Anshul Agarwal

CSE 2014

6 Ranks
in top 50

12 Ranks
in top 100

83 Ranks
overall selections



Rank 4
Vandana Rao



Rank 5
Suharsha Bhagat



Rank 16
Ananya Das



Rank 23
Anil Dhameliya



Rank 28
Kushaal Yadav



Rank 39
Vivekanand T.S

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YEAR LONG TIMETABLE

(Evening Batch)

Monday to Friday | 5:00 PM to 8:30 PM

[illegible]

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YEAR LONG TIMETABLE

(Weekend Batch)

Saturday - 12:00 PM to 8:00 PM

Sunday - 10:00 AM to 8:00 PM

Slots	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
February (05, 06, 12, 13, 19, 20, 26 & 27) + March (05, 06 & 12)	Polity				
March (13, 19, 20, 26 & 27) + April (02, 03, 09, 10, 16 & 17)	Economics	Economics			
April (23, 24 & 30) + May (01, 07, 08, 14, 15, 21, 22 & 28)	Modern History + Post Independent	Modern History + Post Independent	Modern History + Post Independent		
May (29) + June (04, 05, 11, 12, 18, 19, 25 & 26) + July (02 & 03)	Geography	Geography	Geography	Geography	
July (10, 16, 17, 23, 24, 30 & 31) + August (06, 07, 13 & 14)	Ancient India + Medieval India + Art & Culture	Polity	Polity	Polity	Polity
August (20, 21, 27 & 28) + September (03, 04, 10, 11, 17, 18 & 24)	International Relations + World History	International Relations + World History	Economics	Economics	Economics
September (25) + October (01, 02, 08, 09, 15, 16, 22, 23, 29 & 30)	Environment & Ecology + Science & Technology + Disaster Management	Environment & Ecology + Science & Technology + Disaster Management	Environment & Ecology + Science & Technology + Disaster Management	Modern History + Post Independent	Modern History + Post Independent
November (05, 06, 12, 13, 19, 20, 26, 27) + December (03, 04 & 10)	Social Issues & Social Justice + Essay + Compulsory Language Paper	Social Issues & Social Justice + Essay + Compulsory Language Paper	Social Issues & Social Justice + Essay + Compulsory Language Paper	Social Issues & Social Justice + Essay + Compulsory Language Paper	Geography
December (11, 17, 18, 24 & 31) + January '23 (07, 08, 14, 15, 21 & 22)	Ethics + Governance	Internal Security + CSAT	Internal Security + CSAT	Internal Security + CSAT	Internal Security + CSAT
January '23 (28 & 29) + February '23 (04, 05, 11, 12, 18, 19, 25 & 26) + March '23 (04)	Internal Security + CSAT	Ancient India + Medieval India + Art & Culture	Ancient India + Medieval India + Art & Culture	Ancient India + Medieval India + Art & Culture	Ancient India + Medieval India + Art & Culture
March '23 (05, 11, 12, 18, 19, 25 & 26) + April '23 (01, 02, 08 & 09)	Focus Prelims	Focus Prelims	International Relations + World History	International Relations + World History	International Relations + World History
April '23 (15,16,23,29 & 30) + May '23 (06,07,13,14,20 & 21)		Focus Prelims	Focus Prelims	Environment & Ecology + Science & Technology + Disaster Management	Environment & Ecology + Science & Technology + Disaster Management
May '23 (27 & 28) + June '23 (17, 18, 24 & 25) + July (01, 02, 08, 09 & 15)		Ethics + Governance	Ethics + Governance	Ethics + Governance	Ethics + Governance
31st May to 11th June, 2023	PRELIMS 2023	PRELIMS 2023	PRELIMS 2023	PRELIMS 2023	PRELIMS 2023
July '23 (16, 22, 23, 29 & 30) + Aug '23 (05, 06, 12, 13, 19 & 20)					Social Issues & Social Justice + Essay + Compulsory Language Paper
1st September to 30th September, 2023	MAIN 2023	MAIN 2023	MAIN 2023	MAIN 2023	MAIN 2023

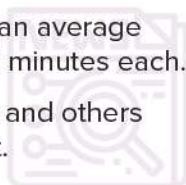


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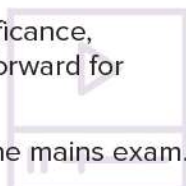
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POLITY

1. Can convicted legislators be disqualified from the Assembly?

Syllabus: Salient features of the Representation of People's Act

Prelims: About Representation of the People Act (RPA), 1951

Mains: Analysis of the provisions for the disqualification of convicted legislators in India and Criminalisation of Indian politics

Context:

- One of the two Uttar Pradesh legislators who were recently convicted of criminal charges has been disqualified and his seat has been declared vacant by the Legislative Assembly secretariat of the state.

Background:

- One of the legislators among the two was sentenced to a three-year jail term for making an inflammatory speech in 2019.
 - Since conviction on a criminal charge that results in a prison sentence of two years or more attracts immediate disqualification of the legislator, the Assembly secretariat declared his seat vacant.
- However, one more legislator who was sentenced to two years imprisonment for his role in the Muzaffarnagar riots of 2013 was not disqualified.

Can convicted legislators be disqualified from the Assembly?

- Section 8 of the Representation of the People Act (RP Act), 1951 mentions various provisions which aim to decriminalise electoral politics.
- As per **Section 8** of the RP Act, 1951, an individual convicted for any of the mentioned categories of offences shall be disqualified from contesting in elections for a period of 6 years.
 - Further, if the punishment is a fine, the six-year period will start from the date of conviction.
 - However, if the punishment is a prison sentence, the disqualification will start on the date of conviction and continues till the completion of six years after the date of release from jail.
- Various categories of offences include:
 - Promoting enmity between different groups on grounds of religion, race, place of birth, residence, language, etc. (Section 153A of IPC)
 - Influencing elections (Section 171F of IPC)
 - Bribery (Section 171E of IPC)
 - Offences relating to rape or cruelty towards a woman (sections 376A or 376B or 376C or 376D of IPC)
- Conviction under serious provisions of the below-mentioned special laws also attracts qualifications regardless of the quantum of punishment.
 - Protection of Civil Rights Act (the practice of

untouchability)

- Customs Act
 - Unlawful Activities (Prevention) Act
 - Foreign Exchange (Regulation) Act
 - Narcotic Drugs and Psychotropic Substances Act
 - All the other criminal provisions form a separate category under which mere conviction will not entail disqualification but a sentence of imprisonment for not less than two years is required to incur such disqualifications.
- Legal protection for legislators against disqualification:**
- Under the provisions of **Section 8(4)** of the RP Act, legislators could avoid immediate disqualifications until 2013.
 - As per the provision of **Section 8(4)**, convicted Members of Parliament or State legislators could continue in their posts, provided they appealed against their conviction in higher courts within three months of the date of judgment by the trial court.
 - i.e the mere filing of an appeal against conviction would act as a stay against the disqualification.
 - However, the Supreme Court in the Lily Thomas v/s Union of India case struck down clause (4) as unconstitutional and ultra vires thereby removing the protection extended to lawmakers.
 - Further, the Supreme Court has the authority to stay the sentence and also the conviction of a person.
 - In a few rare cases, conviction has been stayed to enable the appellant to contest an election.
 - However, the SC has clarified that such provisions must be used for very rare and special reasons.

- Additionally, the RP Act itself provides a solution through the Election Commission.
 - According to **Section 11** of the RP Act, the Election Commission can record reasons and either remove, or reduce the period of, a person's disqualification.
 - For example, the Election Commission exercised this power earlier for Sikkim Chief Minister who had served a one-year sentence for corruption, and reduced his disqualification so as to enable him to contest a byelection and remain in office.

Nut Graf:

Amidst reports of an increasing rate of criminalisation in Indian politics which poses significant threats to the ideals of democracy and rule of law, it has become crucial that the relevant provisions of the RP Act are implemented stringently and the voters of the country choose their leaders wisely in order to decriminalise the Indian political system.

2. Remote voting

Syllabus: Constitution of India — significant provisions (Citizenship)

Prelims: About Electronically Transmitted Postal Ballot System (ETPBS)

Mains: Critical evaluation of Electronically Transmitted Postal Ballot System

Context:

- The Union government recently said that it was considering various ways to facilitate non-resident Indians (NRI) to cast their votes remotely.

Background:

- India with close to 1.35 crore non-resident Indians (NRIs) living across the globe has one of the largest diaspora populations in the world.
- These NRIs sometimes leave the country for short-term work and can miss out on exercising some of their important rights such as voting in the elections held in the country.
- At present, the Election Commission of India (ECI) permits the enrolled overseas citizens of the country to vote in person at the polling stations of their respective constituencies where they have been registered as overseas electors.
 - However, it has become very difficult for migrant citizens to fly in just to cast their votes due to the increasing expenses and this has disincentivised individuals to cast their votes.
- During the 2019 Lok Sabha election, only about 25,606 individuals exercised their mandate among the 99,844 registered electors.
- To address this issue a committee was constituted by the ECI in 2014 to look at methods to facilitate the voting of overseas voters and the committee concluded that “proxy voting” was the most feasible means.
 - Despite opposition, a Bill was passed to amend the Representation of the People Act to enable “proxy voting” but the Bill lapsed with the dissolution of the 16th Lok Sabha (2014-19).
- Later in 2020, the ECI urged the government to allow NRIs to cast their vote through postal ballots i.e. the Electronically Transmitted Postal Ballot System (ETPBS).
 - **ETPBS** allows the NRI voters to cast their vote on a downloaded ETPB and send it to the returning officer of the constituency.

Key advantages of Electronically Transmitted Postal Ballot System (ETPBS):

- ETPBS offers much-needed flexibility for NRI voters as it negates the higher cost and expenses of travelling back to India to cast their vote.
- ETPBS is also a relatively more trustworthy means of registering votes compared to the proxy method of voting.
- Further, it would be simpler for ECI to implement the postal ballot system as ECI has experience using the postal ballot system for the service voters in the country.

Key concerns:

- ETPBS will certainly increase the burden on the embassy or consular officials who are already burdened with the management of the large diaspora of the country.
 - Despite being implemented in several democratic countries, the ETPBS option will certainly be difficult to implement in India due to the sheer scale of the Indian diaspora.
- Further, the NRI voters account for a significant share of the electorate in a few States as compared to service personnel who are a limited number in each constituency thus increasing the challenges of management.
- Critics have argued for extending this facility to longer-term migrants as the concept of limiting voters to specific constituencies on account of their residency accounts for discrimination.
- Critics have also argued against extending the ETPBS facility only to overseas migrants and not to internal migrant workers who also have to travel back to their respective constituencies to register their votes.

Nut graf:

The Electronically Transmitted Postal Ballot System (ETPBS) is seen as the much-needed solution for the long-standing issues of registering the mandate of NRIs. However, clear and strict regulations must be framed before the scheme is implemented in order to safeguard the integrity of the electoral process.

3. Supreme Court on sealed cover affidavits

Syllabus: Means to ensure Transparency & Accountability in Governance

Mains: Rationale and the criticism against judicial practice of sealed cover affidavits

Context:

- The Supreme Court gave a way out of sealed cover affidavits in a recent suggestion to the government and its agencies.

Introduction:

- The Supreme Court has suggested a way out of routinely filing documents in sealed covers, especially in cases touching on national security.
- The court said the government could redact the sensitive portions and show the rest to the petitioners.
- This would address both the state's concerns about “national security” and the “right to know” of petitioners.
- The Supreme Court also said that the government has to present “extenuating circumstances” before confidentially passing materials to the court without disclosing them to the petitioners.
- The observations came during a hearing on the challenge to the telecast ban on the Kerala-based Media One TV channel.
 - The government wanted to pass on its internal files in a sealed cover. The government was reluctant to share the details with Media One TV channel as its security clearance was revoked in January, 2022 on the grounds of “national security and public order”.

- According to the Media One TV channel's argument, a sealed cover affidavit would compel the judges to accept the state's version, that too, in cases in which the government's narrative is under challenge and the fundamental rights of the petitioners are at stake.

Sealed cover jurisprudence:

- It is a practice used by the Supreme Court and sometimes lower courts, of asking for or accepting information from government agencies in sealed envelopes that can only be accessed by judges.
- There is no specific law that defines the doctrine of sealed cover.
- The Supreme Court derives its power to use it from Rule 7 of order XIII of the Supreme Court Rules and Section 123 of the Indian Evidence Act of 1872.
- Under the said rule, if the Chief Justice or court directs certain information to be kept under sealed cover or considers it of confidential nature, no party would be allowed access to the contents of such information, except if the Chief Justice himself orders that the opposite party be allowed to access it.
 - It also mentions that information can be kept confidential if its publication is not considered to be in the interest of the public.
- As for the Evidence Act, official unpublished documents relating to state affairs are protected and a public officer cannot be compelled to disclose such documents.
- Information may also be sought in secrecy or confidence when its publication impedes an ongoing investigation, such as details which are part of the police's case diary; or breaches the privacy of an individual.

Criticism against sealed cover jurisprudence:

- It is against the principles of transparency and accountability of the Indian justice system, standing in contrast to the idea of an open court, where decisions can be subjected to public scrutiny.
- It increases the scope for arbitrariness in court decisions, as judges are supposed to lay down reasoning for their decisions.
- Not providing access to such documents to the accused parties obstructs their passage to a fair trial and adjudication.
- The need for such special privilege to the government is questioned when existing provisions like in-camera hearings already provide sufficient protection to sensitive information.

Judiciary's observation:

- In P Gopalakrishnan V. The State of Kerala 2019, the Supreme Court had said that disclosure of documents to the accused is constitutionally mandated, even if the investigation is ongoing and said documents may lead to breakthrough in the investigation.
- The Supreme Court in the INX Media case in 2019, had criticised the Delhi High Court for basing its decision to deny bail to the former union minister on documents submitted by the Enforcement Directorate (ED) in a sealed cover as it would be against the concept of fair trial.

- In the S.P. Velumani case 2022, the Supreme Court criticised the Madras High Court's decision to permit a report to remain "shrouded in sealed cover" when the State had not even claimed any specific privilege.
- In Anuradha Bhasin vs Union of India case 2020, the court said sensitive portions in government records "can be redacted or such material can be claimed as privileged, if the state justifies such redaction on the grounds, as allowed under the law".

Nut Graf:

The Supreme Court being critical about the government's practice of submitting sealed affidavits suggested the government could redact the sensitive portions and show the rest to the petitioners. This highlights the right to information as an important facet of the right to freedom of speech and expression.

4. The Uniform Civil Code

Syllabus: Indian Constitution-Fundamental Rights

Mains: Relevance of a Uniform Civil Code in Indian Society

Context:

- Recently Gujarat announced that it will constitute a committee headed by a retired High Court judge to evaluate all aspects for implementing the Uniform Civil Code.

Introduction:

- Uniform Civil Code or UCC aims to establish a single national law that would apply to all faith communities in matters of personal concern, such as adoption, inheritance, and marriage.
- The Uniform Civil Code in India will replace the existing religious personal laws in India and have a uniform law that will cater to all citizens, irrespective of their religion.
- Article 44 of the Indian Constitution corresponds with Directive Principles of State Policy (DPSP) states that State shall endeavour to provide for its citizens a uniform civil code (UCC) throughout the territory of India.

Constituent Assembly debates about the UCC:

- The clause on UCC generated substantial debate in the Constituent Assembly about whether it should be included as a fundamental right or a directive principle.
- The matter was settled by vote with a majority of 5:4 to include UCC in DPSP.
 - The sub-committee on fundamental rights under Sardar Vallabhbhai Patel decided that securing a UCC was not within the scope of fundamental rights.
- Members of the Assembly took starkly contrasting stances on the UCC. Some also felt that India was too diverse a country for the UCC.
 - K.M. Munshi rejected the notion that a UCC would be against the freedom of religion as the Constitution allowed the government to make laws covering secular activities related to religious practices if they were intended for social reform.

- o He advocated for the UCC, stating benefits such as promoting the unity of the nation and equality for women.
- o Dr. B.R. Ambedkar felt that the UCC should remain “purely voluntary” in the initial stages.
- The amendments to protect personal laws from the UCC were eventually rejected.
- Muslims in Jammu and Kashmir are still subject to customary law, which is different from Muslim personal law in the rest of the country because the Shariat Act is not applicable there. Additionally, the applicability varies for different Muslim sects.
- Several tribal groups in India, regardless of their religion, follow their own customary laws.

Arguments around the UCC:

In Favour of UCC:

- Applying the UCC in India is meant to bring India together as a country since people from all parts of the country follow different religions, customs, and practices. The aim of bringing the code is to integrate India.
- One national civil code of conduct for all the citizens will treat them as equals. Uniform Civil Code will cover areas like marriage, divorce, inheritance, maintenance, adoption, and succession of the property, where everyone would be equal.
- Uniform Civil Code meant one code over personal laws uniting all the citizens regardless of the religion they follow, the sex to which they belong, along with their gender and sexual orientation. This is because most of the personal laws are based in different communities depending on their religious texts and traditions thus bringing a big divide.
- Secularism is the objective enshrined in the Preamble, a secular republic needs a common law for all citizens rather than differentiated rules based on religious practices.
- Goa is a “shining example”, as per the Supreme court of India, which has a functioning UCC.

Against UCC:

- India has uniformity in most criminal and civil matters like the Criminal Procedure Code, Civil Procedure Code etc, but States have made over 100 amendments to these criminal and civil laws.
 - o For instance, Many states have reduced the fines prescribed and justified by the Centre under the amended Motor Vehicles Act.
- This plurality in already codified civil and criminal laws weakens the argument for ‘one nation, one law’ with respect to diverse personal laws of various communities.
- Even after the enactment of the Hindu Code Bill, all Hindus are not governed by a homogenous personal law, which is the same for Muslims and Christians under their personal laws.
 - o Even Hindu Code bill was amended, diluted, and watered down multiple times to finally be separated into four different Acts — the Hindu Marriage Act, the Hindu Succession Act, the Hindu Minority and Guardianship Act, and the Hindu Adoptions and Maintenance Act in the 1950s.
 - o For instance, While marriages amongst close relatives are prohibited by the Hindu Marriage Act of 1955, they are considered auspicious in the south of India.
 - o Similarly, there is still no uniform applicability when it comes to the Muslim personal law or the Shariat Act that was passed in 1937.

Supreme Court on UCC:

- The Supreme Court in various judgments has called for the implementation of the UCC.
- In Shah Bano case of 1985, where a divorced Muslim woman demanded maintenance from her former husband, the Supreme court while deciding whether to give prevalence to the CrPc or the Muslim personal law, called for the implementation of the UCC.
- The Court also called on the government to implement the UCC in the 1995 Sarla Mudgal judgement as well as in the Paulo Coutinho vs Maria Luiza Valentina Pereira case (2019).

Law Commission on UCC:

- A consultation paper on the reform of family law by the Law commission stated that a unified nation did not necessarily need “uniformity” and secularism could not contradict the plurality prevalent in the country.
- It opined that UCC “is neither necessary nor desirable at this stage”.
- The report also recommended that discriminatory practices, prejudices and stereotypes within a particular religion and its personal laws should be studied and amended.
- The Commission suggested certain measures in marriage and divorce that should be uniformly accepted in the personal laws of all religions.
- It also called for the abolition of the Hindu Undivided Family (HUF) as a tax-exempt entity.

Nut Graf:

The framers of the Constitution envisioned that Uniform civil code would be a uniform set of laws that would replace the distinct personal laws of each religion. Various State governments have constituted committees in this regard. The Union law ministry has requested the 22nd Law Commission of India to undertake an examination of various issues relating to the same.

5. Rajiv Gandhi assassination case convicts released

Syllabus: Indian Constitution; Judgement and cases.

Mains: Remission and premature release of convicts.

Context:

- Release of the remaining convicts in the Rajiv Gandhi assassination case.

Details:

- The Supreme Court ordered the immediate release of six life convicts who have been in prison for more than 30 years in the Rajiv Gandhi assassination case.
- The SC bench said that the Tamil Nadu Cabinet had recommended the premature release to the Governor in September 2018 and the Governor, instead of taking a decision, had passed on their files to the Centre.

- o The Bench held that the Governor was bound by the advice of the Cabinet in cases of murder as their convictions were under the Terrorism and Disruptive Activities (Prevention) Act (TADA Act) which has now lapsed.
- The SC Bench also referred to the judgment of the SC which had ordered the release of former co-convict A.G. Perarivalan by exercising its extraordinary powers under **Article 142 of the Constitution**.
- While ordering their release, the SC bench also took note of the fact that each of these convicts had shown satisfactory conduct during their imprisonment and had also earned postgraduate degrees and diplomas while serving their sentence.

Background Details:

- Former Prime Minister Rajiv Gandhi was assassinated in May 1991 by a suicide bomber. The news of the assassination caused sorrow and revulsion.
- A trial court verdict in 1998 sentenced all accused to death. This was not well accepted by the Supreme Court. The 1999 judgment acquitted 19 of them of conspiracy charges and released them.
- Of the remaining seven, one (who was recruited as a chaperone to the suicide bombers) got the benefit of commutation in the year 2000.
- However, the prolonged incarceration of the 7 convicts (4 on death row and 3 serving life terms) evoked a sense of sympathy among the general public. Political parties in Tamil Nadu made efforts for their release. As a result in 2014, Supreme Court commuted the death sentence to the life of the four convicts.
- The mastermind of the assassination is already dead and only the local collaborators and mid-level operatives were arrested. There was a belief that 31 years of punishment was enough for these middlemen in the plot.
- Tamil Nadu cabinet adopted a resolution in 2018 to release the convicts under Article 161 of the constitution. However, the then Governor did not act for a long time and forwarded it to the Centre for further opinion.
- Earlier this year, the court found no constitutional basis for the Governor's action and ordered the release of one convict (A.G. Perarivalan). This same benefit has now been extended to other convicts as well.
- However, it should not be forgotten that the kin of the victims has suffered a lot. Thereby highlighting that this occasion should be seen as an opportunity to freshly evaluate the premature release of convicts and the review of the remission system.

Nut Graf:

The prolonged incarceration of the convicts of the Rajiv Gandhi assassination case has seen various development over the years. Their release is said to be the culmination of due process in the vibrant legal system. However, there exist some flaws in the remission process that needs review.

6. Unseating of vice chancellors

Syllabus: Functions and responsibilities of the Union and the States, issues and challenges pertaining to the federal structure

Prelims: Article 254 of the Constitution

Mains: Critical evaluation of the recent Supreme Court Judgements on the appointment of vice-chancellors (VC)

Context:

- Two recent judgments on the appointment of vice-chancellors (VC) in State universities by the Supreme Court have come under the limelight.

Supreme Court Judgements:

Gambhirdan K. Gadhvi v/s The State Of Gujarat Case (March 2022):

- In this case, the Supreme Court overruled the appointment of the incumbent VC of Sardar Patel University in Gujarat.
- The apex court quashed the appointment on the grounds that the "search committee" failed to set up a panel for the appointment of VC in accordance with the University Grants Commission (UGC) Regulations of 2018.
- The court also held that since the State law with respect to the appointment of VC had violated (repugnant to) the UGC regulations, the UGC regulations would prevail and the appointment of the VC under the State Law had become void ab initio (from the beginning).

Professor (Dr) Sreejith P.S vs Dr. Rajasree M.S. (October 2022):

- In this case, the appointment of the VC of the A.P.J. Abdul Kalam Technological University in Thiruvananthapuram was questioned.
- The appointment of the VC was challenged on the ground that the search committee had only recommended one name which again violated the UGC regulations.
- The Supreme Court upheld the challenge and quashed the appointment of the VC on the ground that the provision relating to the search committee in the University Act was repugnant to the UGC regulations, and was hence declared void.
- This judgement by the apex court triggered an unprecedented development in the State with the State Governor of Kerala who is the ex-officio Chancellor of all state universities directing about 11 VCs of other state universities to resign on the ground that even their appointments had become void after this judgment by the Supreme Court.
- None of the VCs has resigned and a case is now before the High Court of Kerala.
 - o Meanwhile, in another case, the High Court of Kerala overruled the appointment of the VC of the Kerala University of Fisheries and Ocean Studies on the ground that the appointment violated UGC regulations.

- This development has further intensified the existing tussle between the incumbent Kerala State Government and the Governor.

The core issue in the appointment of VCs:

- Education, which was earlier a State subject, was shifted to the Concurrent list through the 42nd Constitutional Amendment, 1976 and both the Union and the State can legislate on this subject.
- In both cases, the key issue highlighted by the Supreme Court is whether the appointment of VCs is made according to the UGC regulations or the provisions of the State University Act.
- A VC is appointed by the Chancellor as per the provisions of the respective University Act. However, the apex court took into account **Article 254** of the Constitution to decide whether the provisions of the State law are repugnant to the provisions of the Union law which make the State law void.
- In both recent cases, the Supreme Court had observed that the search committee recommended only one name for the appointment of VC which violates the UGC regulations as the regulations mandated the recommendation of three to five names. Hence the SC has declared the State law is void.

Article 254 of the Constitution

- Article 254 deals with inconsistency between laws made by Parliament and laws made by the Legislatures of States. It talks about the doctrine of repugnancy.
- **Article 254(1):** If any legislation enacted by the state legislature is repugnant to the legislation enacted by the Parliament, then the state legislation will be declared void, and the legislation enacted by the Parliament will prevail.
- **Article 254(2):** In case of repugnant legislation passed by the state against the Parliament, the state can enforce the legislation if they receive assent from the President.
- Article 254 of the Indian Constitution successfully establishes the **Doctrine of Repugnancy** in India.
 - Repugnancy is when two pieces of legislation have a conflict between them and when applied to the same facts produce different outcomes or results.

Criticism on the judgement of the Supreme Court:

- Experts point out that the provisions of Article 254 apply only to State law and a substantive law made by Parliament and it excludes the rules or regulations framed by subordinate authorities such as the UGC.
 - Therefore the repugnancy can only occur between the provisions of the University Acts and the UGC Act, and not any regulations of the UGC.
- Rules and regulations framed and formulated by subordinate authorities such as UGC are laid before the Parliament but they do not go through a similar process as a law because they usually do not require the President's assent or approval.
 - These rules and regulations when compared to an Act or a Law have an inferior status and hence cannot be equated with Acts or Laws.

- The Constitution of India does not define the term "Law" in general terms and the definition of "Law" mentioned under Article 13(2) is applicable only to that Article. Therefore, the term "Law" does not include the rules, regulations, etc. for the purpose of Article 254.
- Furthermore, the rules and regulations devised by subordinate authorities of the Union overriding a Law formulated by a State legislature would amount to the violation of principles of federalism enshrined in the Constitution as they result in the negation of the concurrent legislative power granted to the State by the Constitution.
- Experts also point out that the UGC regulations on the appointment of VCs are outside the purview of the main provisions of the UGC Act as none of its provisions refers to the appointment of VCs.

Way forward:

- Article 254 must be analysed in depth before such judgements are made in accordance with the provisions of the Article.
- Further, such issues which particularly affect the rights of States and the federal principles must be accorded the highest priority and serious thought must be given to it.
- The Supreme Court in **S. Satyapal Reddy v/s Govt. of A.P. in 1994** had held that "the court has to make every attempt to reconcile the provisions of the apparently conflicting laws and the court would endeavour to give harmonious construction...The proper test would be whether effect can be given to the provisions of both the laws or whether both the laws can stand together".
 - This way, there would be no need to strike down a State law based on repugnancy with the Union Law.

Nut graf:

The rules and regulations formulated by the subordinate authorities of the Union such as the UGC, overpowering the Act or Laws devised by the elected State Governments will have serious consequences on the federal principles enshrined in the Constitution and therefore such judgments that have accorded higher status to such regulations must be re-examined urgently.

7. Electoral bonds

Syllabus: Important aspects of governance, transparency and accountability

Prelims: About electoral bonds

Mains: Significance of political financing and key issues associated with the Electoral Bonds. Scheme

Context:

- Recently the Union government amended the electoral bonds scheme to allow an additional period of 15 days for electoral bond sales in years which have State elections.

Electoral bonds scheme:

- Electoral Bond is a bearer instrument in the nature of a Promissory Note and an interest free banking instrument. Electoral bond is issued/purchased for any value in multiples of Rs.1,000, Rs.10,000, Rs.1,00,000, Rs.10,00,000 and Rs.1,00,00,000 from the specified branches of the State Bank of India.
- State Bank of India (SBI) has been authorised to issue and encash electoral bonds through 29 of its authorised branches, which would be valid for 15 days from the date of issuance.
- According to law payment cannot be made to a political party after the expiry of the validity period.
- As per Electoral Bond Scheme 2018, electoral bonds may be purchased by a person, who is a citizen of India or incorporated or established in India. A person being an individual can buy electoral bonds either **singly or jointly** with other individuals.
- The electoral bonds shall be encashed by an eligible political party only through a bank account with the authorised bank.
- **An eligible Political Party** is one **registered under the Representation of the People Act, 1951** and **secured not less than one per cent of the votes polled** in the last General Election to the House of the People or the Legislative Assembly.
- The purchaser is allowed to buy electoral bonds only on due fulfilment of all the extant KYC norms and by making payment from a bank account. It will not carry the name of payee.

Crucial role played by political financing:

- All three axes of political competition namely institutional (the regulation of competition between ruling and Opposition parties); organisational (the regulation of competition within a party); and ideological (the role of ideas in determining competition between parties) are significantly influenced by the nature of political finance.
- The extent of centralisation of political funding within a political party reflects whether power in the party is drawn from organisational structures or exercised in a discretionary or an autocratic manner.
- Political financing also plays a crucial role in shaping political competition and when political financing is concentrated only on certain specific political ideologies and parties the political competition would be severely eroded.
- The degree of transparency in political funding is directly related to the efficacy of institutional protections in a country such as the Election Commission of India.

Concerns associated with Electoral Bonds Scheme:**Advantage to ruling party:**

- Experts feel that the overall design of electoral bonds leans towards helping the ruling party.
- As per the ECI data, the ruling party got over 75% of the total electoral bonds sold in 2019-20.
- Further, the electoral bonds also violate the ideas of transparency and openness in political funding as only the government (ruling party) has the access to the transaction details.

- The prevailing information asymmetry and opaqueness to institutional scrutiny have been advantageous to the ruling party.

Advantage to national parties over regional parties:

- The electoral bonds also centralise political funding towards the national units of political parties thereby empowering the national parties over the State and local units.
- According to a Right To Information (RTI) query response, 80% of the electoral bonds out of the ₹5,851 crores of electoral bonds sold in 2018-19 were redeemed in Delhi.
- Further, amendments were introduced to electoral bonds which includes the removal of erstwhile limits on corporate donations. These amendments have given rise to a chance of alliance between national political parties and corporate conglomerates thereby squeezing the space for both local parties and regional capital.
- There have been several instances in the past wherein the nexus between big business conglomerates and national parties have worked against the growth of local/regional parties.

Centralisation of power:

- The centralisation of political power is concentrating more in the hands of the national parties as compared to their regional counterparts.
- This can be seen through various instances of the national ruling party commanding authority over state units such as bringing about changes in the leadership in State governments and imposing measures such as demonetisation and Goods and Services Tax (GST).

Nut graf:

In a democratic country like India the nature of political finance acts as an important determinant of the structure of political competition. Therefore it has become extremely significant for independent institutions like the ECI and the Supreme Court to intervene and plug the loopholes in the electoral bonds to ensure that the democratic values of the country are upheld.

8. The Unlawful Activities (Prevention) Act (UAPA)

Syllabus: Indian Constitution- Features and significant provisions

Prelims: About UAPA

Mains: Significant provisions of UAPA and its significance

Context: Prime Minister had recently said that Central laws such as the Unlawful Activities (Prevention) Act (UAPA) had given an impetus to the system in a decisive fight against terrorism.

Origin of UAPA:

- The UAPA has its origin in the government efforts to control the secessionist movements of the 1960s such as the Naxalbari movements.
- Hence it was passed in 1967 as the Unlawful Activities (Prevention) Act, 1967.

Features of the Act:

- An association or a body of individuals “unlawful” if they indulged in any activity that supported any claim:
 - To bring about “the cession of a part of the territory of India”,
 - To bring about its “secession”,
 - Which questions or disclaims the country’s sovereignty and territorial integrity.
- The term ‘any activity’ includes acts and words, spoken or written, or any sign or representation.
- It provides for a Tribunal to scrutinise the validity of any ban under the act. The tribunal has to confirm within six months the notification declaring an outfit unlawful.
- The ban on an organisation under the act will be for five years.
- UAPA has been amended and expanded multiple times to:
 - Incorporate provisions associated with terrorist acts after the repeal of Prevention of Terrorism Act (POTA), 2002.
 - To give effect to various anti-terrorism resolutions of the United Nations Security Council.
 - To bring the act in line with various requirements of the Financial Action Task Force.

How do UAPA provisions differ from regular criminal law?

- A remand order under UAPA can be for 30 days (it is usually 15 days for regular criminal laws).
- The maximum period of judicial custody before the filing of a chargesheet is extendable from the usual 90 days to 180 days
- The bail conditions are more stringent under UAPA.
 - The court cannot grant bail if there are reasonable grounds for believing that the accusation against a person is prima facie true.
 - It means that the court should not examine the evidence deeply. Instead the court has to go by the version of prosecution which is based on broad probabilities.
 - Thus there is little scope for judicial reasoning as far as bail is concerned, under UAPA.

NIA and UAPA:

- The schedule to the National Investigation Agency (NIA) Act specifies a list of offences which are to be investigated and prosecuted by the NIA.
- The UAPA act has been added to this schedule and hence NIA is empowered to investigate cases under UAPA.

Designation as a Terrorist:

- As per the act the government can designate individuals/organisations as terrorist and it is to be notified by government in official gazette.
- In such cases the onus will be on the person to seek a review to satisfy the govt that the individual is not a terrorist.
- Thus it permits use of the label of ‘terrorist’ for individuals accused of or suspected to be involved in terror activities.

9. Centre constitutes 22nd Law Commission

Syllabus: Statutory, regulatory and various quasi-judicial bodies.

Prelims: About Law Commission of India

Mains: Powers and functions of Law Commission of India

Context: The Centre has constituted the Law Commission of India with Justice (retd) Rituraj Awasthi, former Chief Justice of Karnataka High Court, at its head.

Functions of 22nd law commission

- Identify laws which are no longer needed or relevant and can be immediately repealed.
- Examine the existing laws in the light of Directive Principles of State Policy
- Suggest ways of improvement and reform and also suggest such legislations as might be necessary to implement the Directive Principles and to attain the objectives set out in the Preamble of the Constitution.
- Revise the Central Acts of general importance so as to simplify them and remove anomalies, ambiguities and inequities.

Law Commission of India:

- The Law Commission is an executive body which is established by the government for a fixed tenure. It acts as an advisory body to the Law Ministry.
 - The Law Commission is **neither a statutory nor a constitutional body**.
- It is primarily composed of legal experts.
- The first Law Commission in India was formed in 1955 with its chairman being the then Attorney-General of India, M. C. Setalvad.
- The Law Ministry has initiated the process of forming a new Law Commission.
- The Commission submits reports to the government on various matters of a legal nature.
- The **reports are not binding on the government, which can either reject or accept them.**

Law Commission Functions:

- The main function of the Law Commission is to conduct legal research and review existing laws to bring in reforms.
- Repeal or review of obsolete laws.
- Studying laws that affect the poor and also conducts post-analysis of socio-economic laws
- Recommend the enactment of new laws that may be needed to implement the DPSPs and to achieve the objectives of the Constitution as formulated in the Preamble.
- Give its views on any matter connected with law and judicial administration, that could be referred to it by the Law Ministry.
- Consider requests for providing research to foreign countries as referred to it by the government through the Law Ministry.
- Studying the existing laws concerning gender equality and giving recommendations thereof.
- Studying the effects of globalization on unemployment, food security, and suggest measures for protecting the interests of the marginalized and the vulnerable.

- Prepare and submit reports on all issues and subjects regarding the research undertaken by the Commission for effective steps to be taken by either the central or the state governments.
- Perform any other function which may be assigned to it by the Union Government.

10. Parole vs Furlough.

Syllabus: Indian Constitution- Features and significant provisions

Prelims: About Parole and Furlough

Context: Dera Sacha Sauda (DSS) chief who was convicted in two separate cases of murder, and a charge of rape, was released for the third time prison in the past year, twice on parole and once on furlough.

Parole:

- It involves release of a prisoner with suspension of the sentence.
- It is conditional and is usually subject to the behaviour of the prisoner.
- A person who is released under parole has to periodically report to the authorities for a set period of time.
- It was introduced with a view to humanise the prison system and is hence considered as a reformatory process.

Legal Dimensions of Parole:

- The Prisons Act of 1894 has provisions associated with Parole.
- Since prisons come under state list, the rules associated with parole are governed under the prisons act of each state government.
- The parole is granted by the state executive.
- The convict can move the High Court challenging the rejection of a plea for parole.

Prisoners who are not eligible for parole:

- Prisoners convicted of multiple murders.
- Prisoners convicted under the anti-terror Unlawful Activities Prevention Act (UAPA).

Furlough:

- Furlough is similar to parole but with a difference that it is given in cases of long-term imprisonment.
- In addition the period of furlough granted to a prisoner is treated as remission of his sentence.
- The Prisons Act of 1894 covers the concept of Furlough also.

Difference between Parole and Furlough:

Sl.no	Parole	Furlough
1.	Not a right of the prisoner	Right of a prisoner
2.	Given for a specific purpose (E.g. a wedding of a blood relative)	Granted periodically without any reason

11. Doctrine of Res Judicata

Syllabus: Structure, organization and functioning of the Executive and the Judiciary

Prelims: Doctrine of Res Judicata

Context: The Supreme Court observed that the doctrine of res judicata is attracted not only in separate subsequent proceedings but also at subsequent stages of same proceeding.

What is the doctrine of Res Judicata?

- The meaning of the phrase Res Judicata is that **'the thing has been judged'**. It is a phrase which evolved from a Latin maxim.
- It means that the **issue before the court has already been decided by another court**, between the same parties. As per the doctrine, **since the issue is already settled by a competent court, no party can be permitted to reopen it in a subsequent litigation.**
- This principle is applied when a litigant attempts to file a subsequent lawsuit on the same matter, after having received a judgement in a previous case involving the same parties.
- It is a principle which can be applied in case of **both Civil as well as Criminal legal systems.**
- The doctrine is used in **section 11 of civil procedure code.**

Section 11 of civil procedure code:

- "No Court shall try any suit or issue in which the matter directly and substantially in issue has been directly and substantially in issue in a former suit between the same parties, or between parties under whom they or any of them claim, litigating under the same title, in a Court competent to try such subsequent suit or the suit in which such issue has been subsequently raised, and has been heard and finally decided by such Court."

Why is the doctrine of Res Judicata used?

- Ensuring **finality to the litigation** is the main purpose of doctrine of Res Judicata
- In the **absence** of such a principle a person can **file multiple lawsuits on the same matter**, despite having received a judgement. This may result in incurring **unnecessary expenses and harassment for opponents apart from wasting valuable time of the court.**

How can the doctrine of Res Judicata be used?

For a person to set up a res judicata, he must establish that:

- The decision on which his res judicata is based was judicial in the relevant sense and fact pronounced.
- The court or tribunal which passed the judgement had jurisdiction over the parties and the subject matter.
- The decision was final and based on merits.
- The decision determined a question which was raised in the later litigation.
- The parties or the privies are the same.

Recent Supreme Court Observation on doctrine of Res Judicata

- The Supreme Court had observed that the doctrine can be used at subsequent stages of the same proceedings apart from using it in separate subsequent proceedings.

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ECONOMY

1. Concerns over economic growth trajectory of India

Syllabus: Indian Economy and issues relating to Planning, Mobilization of Resources, Growth, Development and Employment.

Mains: India's economic performance

Context:

- India's declining growth rate.

India's economic performance in the past few years:

- Indian economy is somewhere 'in between', implying that it is neither doing too well nor performing badly.
- Though the exchange rate of the Indian rupee is very poor and inflation is at 7.41%, these are due to global phenomena and nearly all currencies are losing out against the U.S. dollar.
- India is performing poorly in terms of employment generation. The unemployment rate is as high as 7.8%. According to International Labour Organization (ILO) data, collated and presented by the World Bank, youth unemployment in India (for the age group 15 – 24 years) is at 28.3%. This places India in the group of troubled West Asian countries like Iran (27.2%), Egypt (24.3%), and Syria (26.2%), and in a much worse situation in comparison to many Asian countries like Indonesia (16%), Malaysia (15.6%), and Bangladesh (14.7%).
- The GDP growth of India in 2021-22 was 8.7%, which was among the highest in the world. But it should be noted that this growth is relative to the growth during the pandemic. In 2020-21, it was minus 6.6%, placing India in the bottom half of the global growth chart.
- The International Monetary Fund has cut India's growth forecast to 6.1% for the year 2022-23. Two concerns associated with this are:
 - Most of the growth is happening at the top end. With a high unemployment rate, it is very likely that large segments of the population are actually experiencing negative growth.
 - Another concern is India's own sliding performance in comparison to its previous performance.

India's economic growth story:

- Post-independence, India experienced slow growth for nearly four decades. Its growth rose significantly in the 1990s due to the economic reforms of 1991-93.
- In 2003, it rose further, and India joined the ranks of the Asian super performers. From 2005 to 2008, it achieved top positions in most of the charts and grew at, 9.3%, 9.2%, and 10.2% for three consecutive years. However, the official Indian estimates about the growth for these years have been revised downwards. The latest Economic Survey has cut these growth rates to 7.9%, 8.0%, and 8.0% respectively.
- Despite this downward revision, India stood out in global rankings from 2003 to 2011 (except for the great recession of 2008-09).

- The economic slowdown in India began much before the COVID-19 pandemic. It started in 2016 and for four consecutive years, the year-on-year growth rate was lower than the previous year. The following table shows the growth rate of India from 2016 to 2021.

Year	Growth Rate of India
2016-17	8.3%
2017-18	6.9%
2018-19	6.6%
2019-20	4.8%
2020-21	-6.6%

- This downward spiralling of growth rates for four consecutive years has happened for the first time since 1947.

Investment rate of India:

- One of the major reasons behind India's poor performance over the last six years is the low investment rate.
 - The investment rate is the fraction of the national income that is spent on infrastructure development like roads, bridges, factories, and also human capital.
- For many years India had a low investment rate translating into slow growth. The investment rate gradually rose and crossed the 30% mark in the year 2004-05. It reached 39.1% in the year 2007-08. This was the first time India was growing faster than the super performers.
- The investment rate remained just below 40% for 6 years and then began to drop gradually. It had fallen to 32.2% by the year 2019-20.
- There are several drivers for the investment rate in the country like monetary and fiscal policies. It also depends on social and political factors. The level of trust in the economy also determines the investment rate.

Way Ahead:

- The policy focus should shift from a few rich corporations to farmers, small businesses, and ordinary labourers that constitute a large section of the population.
- Moreover, there should be fiscal policy interventions that transfer income to the poor segments of society. This can be a significant step as inequality has disproportionately risen in India in the past few years.
- It is also important to build trust among the general public and focus more on inclusive growth.

Nut Graf:

India has seen a mixed economic growth story in the past. It should learn from its previous experience and reverse the declining trend that it is experiencing since 2016. India has a huge economic prospect owing to its strong fundamentals and abundant talent.

2. Trade tumult

Syllabus: Indian Economy and issues relating to planning, mobilization, of resources, growth, development and employment.

Mains: Trends in Indian exports, imports and trade deficit.

Context:

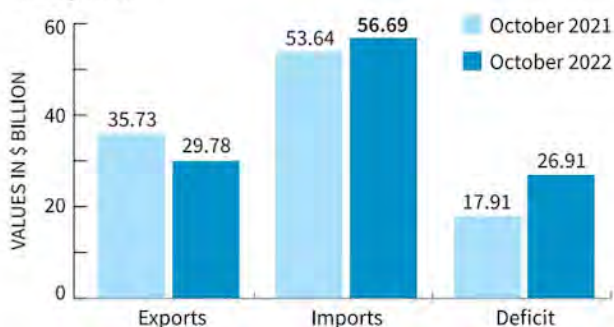
- Indian goods exports declined in October 2022 for the first time since February 2021.

Details:

- India's goods exports in October 2022 shrank below \$30 billion after about 20 months and reports reveal that the goods exports dropped about 16.7% as compared to October 2021 and 16% from September 2022.
- Most of the sectors such as pharmaceuticals and chemicals; engineering goods; gems and jewellery; textiles and handlooms are severely affected.
- Further, the imports increased at 5.7% year-on-year which has widened India's trade deficit by over 50% to \$26.9 billion.
 - October 2022 is said to be the fourth straight month of a \$25 billion-plus goods trade deficit.
- Also, a slight reduction in petroleum imports and a 10.3% shrinking of non-oil, non-gold imports from September 2022 reflects a slowdown in domestic demand.

Widening deficit

India's trade deficit widened to \$26.91 billion last month from October 2021 as exports shrank by 16.7% while imports rose by 5.7%



Source: The Hindu

Path ahead:

- The government has acknowledged the decline in the exports and it attributed this decline to a seasonal Deepavali effect wherein production drops on account of holidays and leaves and imports increase due to festive demand.
- Officials also suggest that there is no need for worry as India has a very low share of global trade which can only grow.
- However, according to experts, export growth cannot be achieved automatically as in a shrinking global market, export rivals such as Vietnam cannot be expected to wait out the slump.
 - But in India, the new **Foreign Trade Policy** which was to replace the current policy of 2015 was deferred again till April 2023 for reasons that included waiting out the current global turmoil.

- Experts urge policymakers and officials to follow a proactive approach in addressing various challenges encountered.

Nut graf:

India's huge trade deficit is expected to further expand on account of higher energy prices, depreciation of Rupee and a slowdown in the global demand impacting the exports. This necessitates proactive actions by the policymakers and other agencies to address the existing concerns as a wait-and-watch approach might not be a viable approach.

3. State of Food and Agriculture Report 2022

Syllabus: Indian Economy - Agriculture

Mains: Key findings of State of Food and Agriculture Report 2022

Context:

- State of Food and Agriculture Report 2022 is a flagship project of FAO that is released every year. The latest report highlights that the lack of access to automation for small and marginal farmers can lead to the widening of inequalities in society.
- It is one of FAO's most important reports and it aims at bringing to a wider audience balanced science-based assessments of important issues in the field of food and agriculture.

Highlights of Report:

The report tracks the number of tractors per 1000 hectares of arable land. The 2022 report talks about agriculture automation.

- The report found that the **penetration of tractors** is high in European and American countries but it is very low in middle and low-income countries.
- It also suggested that only 10 out of 27 services provided in the field of agricultural automation stand to make a profit. Additionally, these 10 service providers are from high-income countries.
- The report also highlighted that there is vast inequality within countries in terms of technology adoption. Certain regions have a high rate of technology adoption in comparison to other regions.

Agriculture Automation:

- Agriculture Automation refers to the **application of technology** in the process of production of crops.
- It can play a very important role in reducing the cost of input and enhancing the income of the farmers.
- Automation in agriculture includes a wide variety of technologies like **harvesters, micro-irrigation techniques, use of advanced technologies like drones, etc.**
- With the help of technology, the farmer can get advanced information about the quality of soil, weather conditions, the kind of crops that are supported by the soil and the possibility of crop destruction due to bad weather conditions.
- All the factors would help the farmers in hedging the risk that may arise because of climatic factors.

Recommendation of Report:

- Policymakers should **avoid rapid automation of agriculture in the labour-intensive sector**. This is because rapid automation would reduce the demand for agricultural labourers, resulting in mass unemployment.
- Additionally, it advocates creating an enabling environment under which the policy of automation can be pushed efficiently without major disruption.
- It also calls for providing **social protection to the least skilled workers** so as to enable them to remain employed during the stress period.
- Automation should take place in such a way that it **promotes inclusivity and sustainability** instead of being discriminatory and exclusive.

FAO:**The FAO is a specialized agency of the United Nations.**

- Established in 1945, the Food and Agriculture Organisation (FAO) has its headquarters in Rome, Italy.
- It was founded with a goal to provide food security for everyone and assure that people will have access to high-quality food in sufficient quantities to achieve a healthy lifestyle.
- Every year, the FAO publishes a number of major 'State of the World' reports related to food, agriculture, forestry, fisheries and natural resources.

Other reports published by the FAO:

- The State of the World's Forests (SOFO)
- The State of World Fisheries and Aquaculture (SO-FIA)
- The State of Agricultural Commodity Markets (SOCO)
- The State of Food Security and Nutrition in the World (SOFI)

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INTERNATIONAL RELATIONS

1. Bali G-20 summit

Syllabus: Important international institutions, agencies, fora – their structure, mandate.

Mains: Significance of G20 summit.

Prelims: Bali G20 summit

Context: Seventeenth G20 summit was held in Bali.

Details:

- The leaders of G-20 countries will gather at the Nusa Dua resort of Bali for the 17th summit. However, the Russian President will not participate in the summit and Russia will be represented by Foreign Minister Sergey Lavrov.
- The summit will focus on post-pandemic recovery and tackling food and energy security that have been severely impacted by the Russian war in Ukraine.

G20 or Group of Twenty

- G-20 was established in 1999 as an acceptable medium between the elitist G-7 (G-8 earlier) and the Organisation for Economic Co-operation and Development (OECD).
- The G20 is a strategic multilateral platform connecting the world's major developed and emerging economies.
- The G20 holds a strategic role in securing future global economic growth and prosperity as the G20 members represent:
 - Over 80% of the global GDP
 - About 75% of international trade
 - Close to 60% of the world's population
- **Members:** Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States, and the European Union.
- It should also be noted that in the coming year the "Troika" of G-20 will be made up of emerging economies for the first time with India, Indonesia, and Brazil.

Agenda of the 17th G-20 summit:

- The motto for the 17th G-20 summit is: Recover Together, Recover Stronger.
- The representatives of the member countries will engage in discussions over three sessions:
 - Food and Energy Security
 - Health Partnership for Global Infrastructure and Investment
 - Digital Transformation
- Moreover, Indonesian President Mr. Joko Widodo will lead the guests to Taman Hutan Raya (Indonesian Mangrove), which was restored through a 30-year project covering around 700 acres.
- This is the first G-20 summit after the Russia-Ukraine conflict and consequent western sanctions. Efforts will be made to build a global consensus on the issue.

- This summit is significant for India as Indonesia will hand over the Presidency of G-20 for the upcoming year to India. India will assume the Presidency on 1 December 2022.
- It is speculated that India will focus on the Global South and the problems it is facing due to geopolitical tensions like food and fuel shortages.
- During the Summit, the leaders of the G-20 countries discussed various aspects ranging from the post-pandemic recovery to addressing the prevailing energy and food insecurity triggered due to the Russian-Ukraine war to climate change-related issues.

Key takeaways from the Summit

- **G20 Leaders' Declaration:** In a declaration adopted at the end of the summit, the G20 leaders have held that cooperation is necessary for global economic recovery, combating global challenges and creating the foundation for strong, sustainable, balanced, and inclusive growth.
 - The declaration also facilitated the commitment of member nations for more collaborations on issues like food security, climate change, health, digital ecosystem, funding poor countries and supply chain issues.
- **Russia-Ukraine war:** Most of the members also strongly condemned Russia's actions in the war in Ukraine.
- **Global economy:** The member nations have agreed to monitor the interest rate rises carefully, avoid spillovers and warned of the rising volatility in their currency moves.
- **Food security:** Countries have made assurances that they would undertake coordinated efforts to address food security challenges and have also commended the Black Sea Grains Initiative in this context.
- **Climate change:** The member nations have agreed to pursue measures to limit the global temperature increase to 1.5°C and reiterated that they obey the temperature goal set during the 2015 Paris Agreement.
 - The US, Japan and other partners announced that they would mobilise around \$20 billion of public and private finance to help Indonesia shut down coal power plants.
 - Further, China and the US have also assured that they would resume cooperation on climate change.
- **U.S.-China ties:** The Presidents of China and the US held bilateral discussions for over three hours and discussed major differences between them over Taiwan, trade restrictions and technology transfers.
- **India takes over the presidency of the G20:** The Indonesian President handed over the gavel to the Indian Prime Minister as the next chair of the grouping.
 - New Delhi is set to host G20 leaders for the summit in September 2023.
 - India will be holding an international summit of this scale for the first time.

India's G20 Presidency

- India's G20 presidency will be starting on the 1st of December 2022.
- The Theme during which India holds the G20 presidency will be "One Earth, One Family, One Future".
- Various issues which will be the focus during India's leadership include environment, sustainable development, healthcare infrastructure, peace and security, women-led development, economic growth and recovery, and technological development and innovation.
- Prime Minister Narendra Modi has assured the G20 leaders that India's presidency will be "inclusive, ambitious, decisive, and action-oriented".

Way forward for India

- The global economy is recovering from the pandemic shock and the world is still facing high food and energy inflation triggered due to the Russia-Ukraine war. India assumes G20 at this critical juncture and is tasked with bringing about a sustainable economic recovery.
- Further, the existing geopolitical tensions across the globe provide an opportunity for India to showcase its leadership and potential in managing both the blocks that have taken shape in global geopolitics.
- India's vision of "Vasudhaiva Kutumbakam" or "One Earth, One Family, One Future," is said to be the need of the hour amidst increased polarization in geopolitics.
- India during the COVID pandemic has demonstrated its leadership qualities by not just manufacturing vaccines and essential life-saving medication for its domestic needs but also for global good. The same is expected to be demonstrated by India during its leadership of G20.
- India should highlight how it has been respecting, obeying and complying with the extant international laws and regulations to push other countries to do the same.

Nut Graf: The 17th G20 summit is significant as it is the first summit after the Russia-Ukraine conflict. The summit is important also because the world is still reeling from the aftershocks of the pandemic and has burgeoning food and energy security issues. It is vital that world leaders come to a good understanding and prompt cooperation and coordination among all stakeholders.

2. Russia's withdrawal from Kherson

Syllabus: Effect of policies and politics of developed and developing countries

Prelims: Kherson region

Mains: Analysis of Russia's move of withdrawing from the Kherson region in Ukraine.

Context:

- Recently, Ukraine's defence and intelligence agencies reported that Russian troops have retreated from Kherson.

The status of Russia's Ukraine invasion



Source: The Hindu

Kherson region and its importance:

- Kherson is geographically situated in a strategic location both for Russia and Ukraine.
- Kherson is located northwest of the Dnipro River and the Kherson region shares borders with the Black Sea, Donetsk and Crimea.
- After Russia annexed Crimea in 2014, the occupation of Kherson by Russia since March 2022 had become advantageous for Russia to transfer its military from Crimea to counter Ukraine.
- Kherson played a crucial role in providing access to Odesa and Black Sea ports in the west and acted as the key route to secure southern Ukraine.
- Likewise for Ukraine, regaining Kherson has become significant to safeguard its population in Kalanchak and Chaplynka districts and also to get back Crimea.
- Further, Kherson is also a key agricultural region with several irrigational channels.

Occupation of Kherson by Russia:

- Kherson was occupied by Russia through intense fighting in early March 2022.
- The battle of Kherson facilitated Russia to capture and occupy the southern part of Ukraine as the battles for Kharkiv and Kyiv continued in the north.
- The capture of Kherson has facilitated Russia to capture the other key port cities such as Mariupol in the Sea of Azov, and Odesa thereby extending its control.
- The irrigation canals of the Kherson region were utilised as defence positions and a strong line of defence was developed to prevent Ukraine's counter-attacks.
- Russia had further positioned its soldiers in Kherson and stockpiled the ammunition.

Reasons for Russia's withdrawal from Kherson:

- **Mobilisation failure:** As Russia made rapid advancements in capturing the southern and northern cities of Ukraine, its military resources which included personnel and weapon systems started to deplete at a rapid rate.
 - Despite following partial mobilisation strategies to address these challenges, the failure of new recruits became an additional challenge to Russia to check Ukraine's counter-attacks in the Kherson region.

- **Inability to govern Kherson:** Despite imposing martial law, Russia has failed to effectively govern or administer Kherson as the three-tier security deployed in the area could not enforce Russia's control on the ground.
- **Increasing counter-attacks from Ukraine:** Ukraine was initially supplied only with short-range and low-grade weapons by the West. However, as Russia continued to increase its aggression, the West increased its support to Ukraine by extending military training of personnel as well as the supply of medium to high-range weapons systems which include the Howitzers, HIMARS, air defence systems, battle tanks and drone technologies.
 - This increased support from the west has helped Ukraine to reclaim various Russian-occupied areas such as Izyum, northeast, southeast of Kharkiv, Izyum-Slovyansk, Kupiansk and northwest Kherson.

Analysis of the move by Russia:

- The challenges of mobilisation and re-mobilisation of Russia's defence systems, shortage of weapons and the failure to restrict the advancements of Ukraine forces have played a major role in forcing Russia to withdraw from Kherson.
- As Ukraine continues to enhance its military capacity with the help of support from the West such as upgrading from land-based to air-based to heavy battle tanks, Russia is now facing trouble in retaining its captured territories in Ukraine.
- Similar to the withdrawal from Kherson after the initial attack, Russia has earlier shifted its strategy of capturing Kyiv to focusing on eastern Ukraine after undertaking attacks on Kyiv.
 - Likewise, Russia had also withdrawn from its strategy to capture Kharkiv as taking control of the Donetsk and Luhansk regions became a more important objective.
- However, the Ukrainian forces and leadership predict the move by Russia to be a delusion for a retreat.
- Further, the leaders of the U.S. and EU have regarded the withdrawal as a "difficult position" for the Russian President and have criticised the brutality of deporting Ukrainians.

Nut graf:

Withdrawal of Russia from Kherson has come at a critical juncture of the Russia-Ukraine war as it exposes serious gaps in Russia's military might, highlights Russia's strategy to withdraw under serious attack or resistance and reflects the larger political objectives of both the sides which provide an idea about how far they would go with the war.

3. The continuing stalemate in Myanmar

Syllabus: Effect of policies and politics of developing countries on India's interest.

Mains: Military coup in Myanmar and efforts to restore Democracy.

Context:

- Twenty-One months have passed since a military coup in Myanmar.

Details:

- A military coup in 2021 in Myanmar derailed a decade-old experiment with limited democracy. As a consequence of it, the citizens of Myanmar are suffering, authorities and opposition forces are locked in a cycle of violent clashes, and the economy has worsened.
- The ASEAN's mission to generate a solution in Myanmar has also failed.

Background Details:

- The Myanmar military (Tatmadaw) was unhappy with the victory of the Aung San Suu Kyi-led National League for Democracy in the elections of November 2020. As a result, it launched a coup, violating the constitution.
- The Military was of the view that the people of Myanmar would accept its diktat much like the previous decades. It underestimated the public's commitment to freedom and democracy.
- Even after killing more than 2,300 people and imprisoning thousands (including Ms. Suu Kyi) the military still faces public angst and rebellion.

Opposition Parties' role in restraining Military:

The opposition has controlled the military from having its way for controlling Myanmar through two dimensions:

- The National Unity Government (NUG) has effectively channeled popular indignation against military rule.
 - NUG is a parallel government not recognized by any state. However, it receives political and financial support from abroad.
- Nearly 20 ethnic armed organizations (EAOs) that are located in the east, west, and north of Myanmar's periphery, adopted different approaches towards the post-coup conflict. For instance, groups like the Kachins and Karens supported the NUG, whereas groups operating in the Chin and Rakhine states got engaged in a fierce armed conflict with the military.
- But it was observed that owing to the paucity of resources and lack of leadership in NUG and divergences and relative weaknesses in the EAOs, the efforts are unlikely to defeat the military.

International Dimension:

- Approximately 1.1 million Rohingya that migrated to Bangladesh due to military oppression in 2017 continue to languish there. The efforts of Bangladesh to arrange their safe return have failed multiple times. Moreover, armed clashes between the military and their ethnic opponents in the border region of Myanmar have a spillover effect on Bangladesh.
- The United Nations has criticized the coup and has expressed concern over the violence. It has raised the voice for the release of all political prisoners, encouraged dialogue among the stakeholders, and supported a democratic transition. However, the UN Secretary General's special envoy could not achieve much in promoting peace in the region.
- There exist sharp divisions within the international community on dealing with the issue that has resulted in the failure of UN efforts. For instance:
 - Western countries are critical of the military's action and have put severe restrictions and sanctions. They have also supported NUG.

- o Russia provided considerable support to the military regime, seeing it as an opportunity to strengthen bilateral relations in defence and energy supplies.
- o China, on the other hand, has kept the door open for democracy while continuing to trade and exploit the opportunity of the China-Myanmar Economic Corridor.
- o The ASEAN nations are further divided:
 - Indonesia, Malaysia, and Singapore favour democracy.
 - Thailand and Laos favour the military regime.
 - the Philippines and Vietnam are ambivalent.
- The disunity among the ASEAN members has resulted in the non-implementation of the Five-Point Consensus.
- The post-coup conditions have adversely impacted bilateral cooperation between India and Myanmar. Various mega projects are halted and around 50,000 refugees have camped up in Mizoram. India has proactively advocated the release of prisoners, early restoration of democracy, and internal dialogue.

Way Ahead:

- India can also explore the option of playing a mediatory role along with ASEAN and like-minded neighbouring countries.
- Other countries can provide support to Myanmar in creating a suitable environment for a political settlement. Countries like Japan and Norway can play an important role in brokering peace.
- It should be noted that the major role lies in the leadership and elites of both groups in Myanmar. They should find a route similar to 12-2011.

Nut Graf:

The prolonged military coup in Myanmar has derailed both its economy and most importantly its democratic polity. The international community should put a united front to broker peace in the region.

4. 19th ASEAN-India Summit

Syllabus: Regional & Global Groupings & Agreements Involving India and/or Affecting India's Interests

Mains: Significance of ASEAN in India's foreign policy

Context:

- Vice President Shri Jagdeep Dhankhar recently led the Indian delegation at the 19th ASEAN-India Summit in Phnom Penh, Cambodia.

Introduction:

- The Vice President, Shri Jagdeep Dhankhar led the Indian delegation, including the External Affairs Minister, Dr S. Jaishankar, at the 19th ASEAN-India Summit in Phnom Penh, Cambodia.
- The Vice President hailed the deep cultural, economic and civilizational ties that have existed between India and South East Asia from time immemorial.
- The Association of Southeast Asian Nations (ASEAN) is central to India's Act East policy. It is at the heart of India's Indo-Pacific outreach.
 - o The Indian Prime Minister at Shangri La

Dialogue laid out India's Indo-Pacific policy that highlighted that ASEAN will remain at the core of India's policy outreach in the region.

Enhanced collaboration:

- At the summit, ASEAN and India adopted a joint statement announcing the elevation of the existing Strategic Partnership to Comprehensive Strategic Partnership.
- Both sides reaffirmed the importance of maintaining and promoting peace, stability, maritime safety and security, freedom of navigation and overflight in the Indo-Pacific region.
- It also recognised the importance of "unimpeded lawful maritime commerce" and the disputes should be resolved by following "universally recognised principles of international law, including the 1982 United Nations Convention on the Law of the Sea (UNCLOS), and the relevant standards and recommended practices by the International Aviation Organisation (ICAO), and the International Maritime Organisation (IMO).
- Both sides also agreed to intensify maritime cooperation including anti-piracy operations, armed robbery against ships, maritime safety, search and rescue (SAR) operations, humanitarian assistance, and emergency response and relief.
- Both sides announced plans to enhance collaboration against "terrorism and transnational crimes including international economic crimes and money laundering, cybercrime, drugs and human trafficking and arms smuggling."
- Both sides decided to expand their collaboration in the space industry including "through the establishment of Tracking, Data Reception and Processing Stations in Vietnam and Indonesia".
- India and ASEAN agreed to expedite the review of the ASEAN-India Trade In Goods Agreement (AITIGA).
- It also agreed to enhance ASEAN-India cooperation on the digital economy through a series of regional capacity-building activities in digital transformation, digital trade, digital skills and innovation, as well as Hackathons.

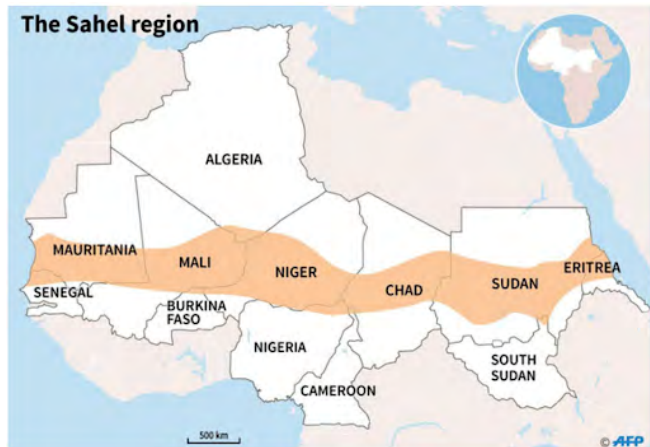
ASEAN Outlook on the Indo-Pacific:

- This envisages ASEAN Centrality as the underlying principle for promoting cooperation in the Indo-Pacific region, with ASEAN-led mechanisms, such as the East Asia Summit (EAS), as platforms for dialogue and implementation of the Indo-Pacific cooperation, while preserving their formats.
- Its main goals are to defend the regional architecture based on rules, support tighter economic cooperation, and help to establish an atmosphere that is conducive to peace, stability, and prosperity in the region. This builds confidence and trust.
- ASEAN Outlook on the Indo-Pacific involves the further strengthening and optimization of ASEAN-led mechanisms, including the East Asia Summit (EAS), the ASEAN Regional Forum (ARF), the ASEAN Defence Ministers Meeting Plus (ADMM-Plus), the Expanded ASEAN Maritime Forum (EAMF) and others such as the relevant ASEAN Plus One mechanisms.

- Issued at 19th summit, the joint statement noted that both the ASEAN Outlook on the Indo-Pacific (AOIP) and the Indo-Pacific Oceans Initiative (IPOI) share relevant fundamental principles in promoting peace and cooperation as outlined in the ASEAN-India Joint Statement on Cooperation on the AOIP for Peace, Stability and Prosperity in the Region adopted at the 18th ASEAN-India Summit in 2021.

Nut Graf:

ASEAN and India on the occasion of the 19th ASEAN-India Summit to commemorate the 30th Anniversary of their Dialogue Relations acknowledged the strong growth in their relationship and agreed on deeper collaboration in various sectors to further enhance the Strategic Partnership in the Indo Pacific.



Source: euractiv.com

5. France's security involvement in Africa

Syllabus: Effect of Policies & Politics of Developed & Developing Countries on India's Interests

Mains: Global Efforts against terrorism

Context:

- On November 9, 2022, French President Emmanuel Macron announced the end of Operation Barkhane in Africa.

What is Operation Barkhane?

- France began its military operations in Sahel in January 2013. Initially, Operation Serval was started primarily to target Islamic extremists linked to al-Qaeda who took control of northern Mali.
- In 2014, the mission was expanded, renamed 'Operation Barkhane' and was aimed at counter-terrorism.
- The objective was to assist local armed forces to prevent the resurgence of non-state armed groups across the Sahel region.
 - Around 4,500 French personnel were deployed with the local joint counter-terrorism force.

Sahel region of Western Africa:

- The recent announcement comes after the French soldiers withdrew from Mali on August 15, 2022.
- The development also marks a strategic shift for the French military forces deployed in the Sahel region of Western Africa, which are assisting several countries to contain jihadist insurgencies.
- The Sahel region consists of the vast semi-arid and mostly inhospitable region of Africa, separating the Sahara Desert to the north and tropical savannas to the south.
- It includes parts of Senegal, Mauritania, Mali, Burkina Faso, Algeria, Niger, Nigeria, Cameroon, the Central African Republic, Chad, South Sudan, Eritrea, and Ethiopia.

Has France achieved its objectives?

- French operations had two objectives in the Sahel.
 - To liberate Mali from the insurgency in the north and to see through counter-terrorism operations in West Africa, including the neutralisation of key terrorists.
- In its major successes, France regained Mali's northern regions from the extremists in 2014 through Operation Serval.
- In 2020, Abdel Malek Droukdel and Bah Ag Moussa, key leaders of al-Qaeda were killed in French-led operations.
- The success of Operation Serval led to the inception of Operation Barkhane aimed at counter-terrorism in Mali, Niger, Burkina Faso, Mauritania and Chad. However, Operation Barkhane saw a series of failures.
- The region witnessed the growth of new groups affiliated to terrorist organisations, including the Islamic State despite the operation.
- The failure of the operation led to a humanitarian crisis.
 - According to the Armed Conflict Location & Event Data Project (ACLED), the violence had claimed 5,450 lives across Mali, Burkina Faso, and Niger in just the first half of 2022, recording a significant increase from the previous years.
- Operation Barkhane's unfulfilled objective to resolve the region's insurgencies sparked an increase in civilian support to the military and has contributed to the subsequent political uncertainties in the Sahel.

Why did France end its operation?

- France's relations with the military rulers grew hostile after a series of coups in Mali, Burkina Faso and Guinea.
 - Mali recently expelled the French ambassador when he disagreed with the junta's decision to remain in power until 2025.
 - France was also insolent about Malian authorities negotiating a peace deal with insurgent groups.
- Anti-French sentiments and questions over France's intentions erupted in the region, with a further demand for France's withdrawal as Operation Barkhane was widely perceived as a failure.
- France, and other Western countries claim that the Wagner Group, a private military company close to Russia, is playing a major role in fuelling the insurgency and discrediting French withdrawal.

- o For Africa, the Wagner Group is an alternative that engages with military governments, without abiding to human rights and democratic standards.

How will this affect Islamist insurgent groups and militant violence in Mali?

- Armed violence is likely to continue apace or even increase following the Western withdrawal from Mali.
- Despite Operation Barkhane's inability to alter the strategic trajectory of the conflict, it has served as tactical and operational disruptors to militant groups, and will now be absent.
- This decrease in military pressure comes as militancy is on the rise in Mali. Violence linked to militant Islamic groups like Jama'at Nasr al-Islam wal Muslimin (Group for the Support of Islam and Muslims—JNIM) and the Islamic State in the Greater Sahara (ISGS) rose 70 percent in 2021 compared to 2020.
- A decrease in military pressure against this hegemony will allow JNIM to further consolidate its political control, enforce its conservative ideology, and complicate any efforts by the Malian state to reestablish control of these areas.
- The current withdrawal, coupled with the Malian government's signals of openness to negotiations with militant groups, could offer an opportunity for dialogue between Mali and JNIM.
- The "security vacuum" left by the departing French forces would likely increase local violence, particularly violence against civilians.

Nut Graf:

France has formally ended its decade-long operation to fight Islamist insurgents in the Sahel over several differences and failure of the operation. France is reducing the exposure and visibility of its military forces in Africa and focusing on cooperation and support, mainly in terms of equipment, training, intelligence and operational partnerships for countries in the Sahel region.

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ART AND CULTURE

1. Wangala dance

Syllabus: Salient aspects of Art Forms

Prelims: Wangala dance

Context:

- The members of the Garo tribal community perform the Wangala dance on the occasion of “The Rising Sun Water Fest-2022” held on the banks of Umiyam Lake in Meghalaya.



Source: The Nicobar Diaries

Wangala Dance:

- Wangala dance is one of the most popular folk dance forms among the Garos of Meghalaya.
- Wangala dance is performed during the Wangala festival which is also known as a “100 drums festival”.
- The Wangala Festival is a harvest festival held in honour of Saljong who is the “Sun-god of fertility”.
- The festival also marks the end of a period of toil which brings good output from the fields and indicates the onset of winter.
- While performing the dance people are dressed in colourful attire with feathered headgear.
- During the performance, the main motif is a queue of two parallel lines – one of the men and the other of women clad in their festive fineries.
- The instruments used during the dance include long oval-shaped drums, gongs, and flutes made of buffalo horn.

2. Nicobari hodi boat

- Tribal Development Council, Andaman & Nicobar Islands is seeking the Geographical Indication (GI) tag for the Nicobari hodi boat.
- This is the first application from the Andaman & Nicobar Islands seeking a tag for one of its products.
- The hodi is the Nicobari tribe's traditional craft. It is an outrigger canoe, very commonly operated in the Nicobar group of islands.
 - The design of Hodi slightly varies from island to island. In Andaman and Nicobar Islands, except the Jarawa tribe other tribes are using different kinds of outrigger canoes.
 - These canoes have proper buoyancy and stability for racing. Hodi races are held between islands and villages.
 - The technical skills for building a hodi are based on indigenous knowledge inherited by the Nicobarese from their forefathers. The hodi is built using either locally available trees or from nearby islands, and its design varies slightly from island to island.
- The tuhet, a group of families under a headman, consider the hodi an asset.

SCIENCE AND TECHNOLOGY

1. The new hybrid variant of mustard

Syllabus: Awareness in the field of biotechnology

Prelims: About Genetically Modified (GM) mustard and other GM crops

Mains: Significance of hybrid varieties of mustard and the concerns associated with it

Context:

- The Genetic Engineering Appraisal Committee (GEAC) which is the country's apex regulator of genetically modified crops working under the aegis of the Union Environment Ministry has approved the environmental release of a genetically modified (GM) variant of mustard.

Dhara Mustard Hybrid-11 (DMH-11):

- Dhara Mustard Hybrid-11 (DMH-11) is a genetically-engineered variant of mustard.
- It is also regarded as hybrid mustard and has been developed by researchers at the Centre for Genetic Manipulation of Crop Plants at the University of Delhi.
- The number "11" in DMH-11 refers to the number of generations required after which the desirable traits manifest.
- Efforts to develop hybrid mustard in India have been made for decades and DMH-1 was regarded as a breakthrough in this context.
 - The DMH-1 hybrid variant was developed without the use of transgenic technology and was approved for commercial release in northwest India in 2005-2006.
 - However, researchers said that this technology wasn't feasible or capable of consistently producing hybrid mustard.
- Mustard is a self-pollinating plant and hence it has been a challenge for plant breeders to cross different mustard varieties to induce desirable traits.
 - Genetically modified mustards are produced by switching off their natural self-pollinating trait to enable crossings and restoring the trait later to enable seed production.
- The DMH-11 is produced as a result of a crossing between two varieties of mustard namely the **Varuna** and **Early Heera-2**.
 - To facilitate such crossing, genes from two soil bacterium called **Barnase** and **Barstar** were introduced.
 - Barnase in Varuna induces temporary sterility and restricts its natural self-pollination traits and tendencies.
 - On the other hand, Barstar limits the effects of Barnase on Heera thereby allowing seeds to be produced.
- Therefore, DMH-11 is said to be a **transgenic crop** as foreign genes from different species are used in its production.

Significance of hybrid varieties of mustard:

- The DMH-11 has a lot of benefits as it not just produces a better yield but is also fertile.
- As per the studies conducted by the Indian Council of Agricultural Research (ICAR), DMH-11 produced 28% higher yields than its parent Varuna and 37% better yield than various local varieties that are considered the best in different agro-climatic zones.
- DMH-11 also highlights the potential of the Barnase-Barstar system and opens up new prospects for using this system as a platform technology to develop newer hybrids.
- As per the experts, better hybrids help meet India's rising edible-oil import bill.
 - Mustard (*Brassica juncea*) is mainly cultivated as a Rabi crop in states such as Rajasthan, Haryana, Punjab and Madhya Pradesh but India still imports about 55-60% of its domestic edible-oil requirement.
 - According to the National Academy of Agricultural Sciences, about 13.3 million tonnes of edible oil were imported which cost around ₹1,17,000 crores in 2020-21 on account of low productivity that has remained stagnant for over two decades.
- Further, India is also importing hybrid varieties of oil seed such as mustard and rapeseed from Canada, China and Europe.

Key causes of concern:

- The development of transgenic varieties of mustard has often been controversial because of the use of foreign genes from different species.
- Activists have also raised concerns about the model of preparation of mustard hybrids which uses another gene known as the "bar gene" that makes the crop tolerant to a herbicide called glufosinate-ammonium.
 - Activists opine that GM mustard is not evaluated as a herbicide-tolerant crop thereby posing potential risks.
- Further, there have also been concerns about the potential of GM mustard plants dissuading bees from pollinating the plant which can cause environmental catastrophes.

Way forward:

- The GEAC had earlier approved the environmental release of GM mustard in 2017 too but the process was halted as a case was registered against it in the Supreme Court.
- Additionally, the government led by the Union Environment Ministry has still not supported GM mustard officially despite the approvals from GEAC.
 - This was seen even in the case of **Bt Brinjal** which was the first transgenic food crop that was cleared by the GEAC in 2009 but was stalled by the then government which felt that more tests were required.
 - At present, **Bt-cotton** is the only transgenic crop cultivated in India.

- The GEAC approval allows the cultivation of DMH-11 only under the supervision of the ICAR and the ICAR has held that the GM mustard would be commercially available only after “three seasons” after due evaluation.

Nut Graf:

The GEAC has approved the environmental release of a hybrid variety of mustard named DMH-11 which is endorsed by experts as a key to improving India's productivity. However, stakeholders must take into account the concerns and the possible environmental hazards before moving for the large-scale introduction of the variety.

2. Cordy gold nanoparticles

Syllabus: Achievements of Indians in science & technology

Prelims: Cordy gold nanoparticles

Context:

- A collaborative experiment by scientists which led to Cordy gold nanoparticles (Cor-AuNPs) has received an international patent from Germany.

Cordy gold nanoparticles (Cor-AuNPs):

- These are nanoparticles derived from the synthesis of the extracts of Cordyceps militaris and gold salts.
 - Cordyceps militaris is a high-value parasitic fungus. It is also regarded as a “super mushroom” for its remarkable medicinal properties.
 - Gold salts are ionic chemical compounds of gold used in medicine.
- These Cordy gold nanoparticles are expected to make drug delivery in the human body quicker and surer.
- According to experts the penetration of drugs in the cells is better and more proficient when the drug particles are smaller. In this context, Cordyceps militaris adds bioactive components to the synthesis of gold nanoparticles for better penetration.
- The research on biosynthesised nanogold particles unlocks a whole new application of nanoparticles in the development of therapeutic drugs that can be delivered in the form of ointments, tablets, and capsules among others.
- A group of scientists from India had been working extensively on the genetic diversity and medicinal properties of the wild Cordyceps mushroom grown in the eastern Himalayan belt and they have now standardised the cultivation of this mushroom with antimicrobial, antidiabetic and antioxidant properties.

3. Vikram-S rocket

Syllabus: Achievements of Indians and awareness in the field of Space

Prelims: About Vikram-S rocket and Prarambh space mission

Context:

- The Vikram-S rocket is poised to create history as it is gearing up for launch from Sriharikota.

Vikram-S rocket:

- Vikram-S is India's first-ever privately developed rocket.
- The rocket has been named “Vikram” as a tribute to **Vikram Sarabhai** who is a renowned scientist and the founder of the Indian space program.
- Vikram-S rocket is a single-stage sub-orbital launch vehicle.
 - Sub-orbital launch vehicles are those which travel slower than the orbital velocity i.e they travel fast enough to reach outer space but not fast enough to stay in an orbit around the Earth.
- At present, the Vikram rockets are being developed in such a way that they use **solid and cryogenic fuels** and are capable of carrying about **290 kg to 560 kg payloads to sun-synchronous polar orbits**.
- Vikram-S rocket has been developed by the Hyderabad-based **Skyroot Aerospace** and is set to be launched as part of the “**Prarambh Space Mission**”.
 - Space missions in the country have been undertaken only by the Indian Space Research Organisation (ISRO) till now and Prarambh Space Mission will be the **first-ever space launch by a private company**.
- The Prarambh space mission aims to carry three payloads into space which include a 2.5-kilogram payload developed by students from several countries.
- The Vikram-S rocket and Prarambh mission have been developed by Skyroot Aerospace with extensive support from ISRO and IN-SPACe.

Skyroot Aerospace:

- The Hyderabad-based Skyroot is the first start-up to sign a Memorandum of Understanding (MoU) with ISRO to launch its rockets into space.
- Set up in 2018, Skyroot has successfully built and tested India's first privately developed cryogenic, hypergolic-liquid and solid fuel-based rocket engines using advanced composite and 3-D printing technologies.
- The aim of opening the space sector for private companies in India is to provide a conducive environment for cost-efficient satellite launch services by disrupting the entry barriers. This will help the companies in advancing their mission and make spaceflights affordable, reliable and regular.

4. CRISPR technology

- For the first time, scientists have used the CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) technology to insert genes that allow immune cells to attack cancer cells.
- This leaves the normal cells unharmed and increases the effectiveness of immunotherapy.
 - The CRISPR gene editing technique has been previously used in humans to remove specific genes to allow the immune system to be more activated against cancer.
- CRISPR is used to not only take out specific genes, but also to insert new ones in immune cells efficiently redirecting them to recognise mutations in the patient's own cancer cells.

- When infused back to patients, these CRISPR-engineered immune cells preferentially traffic to the cancer and become the most represented immune cells there.
 - The human immune system has specific receptors on immune cells that can specifically recognise cancer cells and differentiate them from normal cells. These are different for every patient.
 - The researchers found an efficient way to isolate these immune receptors from the patient's own blood which is a leap forward in developing a personalised treatment for cancer.

5. Artemis Mission

Syllabus: Awareness in the field of Space

Prelims: About Artemis Mission

Context: NASA's Artemis 1 mission was recently launched from Kennedy Space Center in Florida.

Artemis Mission

- The mission is named after Artemis, the goddess of the moon, who is the twin sister of Apollo from Greek mythology.
- Artemis I is an uncrewed space mission, which will be the first of NASA's deep space exploration systems.
- The Artemis 1 mission was earlier scheduled to launch on November 14 but it had to be postponed because of tropical storm Nicole.
- Artemis was launched on the Space Launch System (SLS), which is the most powerful rocket in the world. The SLS rocket was designed for missions beyond low-earth orbit (LEO). It can take cargo and crew to the moon and beyond.
- The SLS rocket is carrying the Orion spacecraft from the Earth to lunar orbit.
- Artemis II is expected to follow in Artemis I's footsteps.
- Artemis is considered NASA's next-generation lunar exploration mission. With the Artemis programme, NASA aims to establish a sustainable presence on the Moon to prepare for missions to Mars. Artemis I is an uncrewed space mission, which will be the first of NASA's deep space exploration systems.
- Unlike Artemis I, Artemis II will have a crew aboard Orion and will be a test mission to confirm that all of the spacecraft's systems will operate as designed when it has humans on board.

Artemis 1 mission



Source: Evening Standard

Aim of NASA Artemis:

The Artemis programme will help NASA attain the following objectives:

- To land humans on the moon by 2024 and explore more of the lunar surface. With the Artemis mission, NASA will land the **first woman and first person of colour on the Moon**. It will send astronauts to new locations, starting with the Moon's South Pole, where no human has ever been before.
- To set up a community on the Moon, which will drive a new lunar economy all together.
- To learn more about the origin of Earth, the Moon, and our solar system as a whole. The learnings will be utilised to take the next giant leap, that is, to send the first astronauts to Mars.
- To display new technologies, capabilities, and business approaches needed for future exploration.
- With the Artemis mission, NASA will:
 - Find and use water and other important resources needed for long-term exploration
 - Learn how to live and operate on the surface of a different celestial body
 - Prove the technologies we need before sending astronauts on missions to Mars, which can take up to **three years roundtrip**

Other space agencies which will contribute towards the Artemis mission

- Canadian Space Agency: will support by providing advanced robotics for the gateway
- European Space Agency: will provide the International Habitat and the ESPRIT module, which will deliver additional communications capabilities, among other things.
- Japan Aerospace Exploration Agency: plans to provide habitation components and logistics resupply.

DEFENCE AND INTERNAL SECURITY

1. No Money For Terror (NMFT) conference

Syllabus: Role of External State & Non-State Actors in Creating Challenges to Internal Security

Mains: Various Initiatives to counter terrorisms

Context: Recently, third 'No Money for Terror' (NMFT) Ministerial Conference on Counter-Terrorism Financing was held in New Delhi, India.

No Money for Terror Conference (NMFT):

- The key agenda behind the NMFT conference is to share expertise and good practice in combating terror financing that can be implemented internationally.
- The NMFT started in 2018 as an initiative of the French Government and the first-ever conference was held in Paris in April 2018.
 - This conference was named "International conference on combating the financing of Daesh and Al-Qaeda".
 - Through this conference, the delegates agreed to fully criminalise terrorism financing, improving the traceability and transparency of financial flows by developing frameworks and also reiterated the need for effective implementation of UN sanctions, cooperation on intelligence sharing and capacity building between the countries.
- Later, the second round of the conference was hosted by Australia in Melbourne in November 2019.
 - Through this conference, kidnapping for ransom and the advent of new-age technologies like cryptocurrencies were recognised as new channels of terrorism financing.
- It was to be held in India in 2020 but was postponed due to the Covid-19 pandemic.
- The third edition was held in India recently. The key focus of the latest edition of the conference was on international cooperation in combating terror funding and sharing of experience, understanding and best approaches to combat such threats with a special focus on the South Asian region.

2022 Conference:

- It was attended by about 450 delegates from across the world, including Ministers, Heads of Multilateral organisations and Financial Action Task Force (FATF) Heads of Delegations.
- During the Conference, deliberations were held in four sessions with focus on:
 - Global Trends in Terrorism and Terrorist Financing.
 - Use of Formal and Informal Channels of Funds for Terrorism.
 - Emerging Technologies and Terrorist Financing.
 - International Co-operation to Address Challenges in Combating Terrorist Financing.

India's stand in 2022 Conference:

- PM Modi in his address to the conference warned against nations that use terrorism as a tool of foreign policy.
- India has proposed a permanent secretariat for 'No Money for Terror' (NMFT) ministerial conference, in order to sustain the global focus on countering the financing of terrorism.
- India urged the international community to take cognisance of threats emerging from regime change in Afghanistan, as the last one had led to 9/11 attacks.
- India called for the strong cooperation between the United Nations Security Council, Financial Action Task Force, Financial Intelligence Units, and the Egmont Group in the prevention, detection and prosecution of illegal fund flow.
- India alerted that terrorists should not be allowed to misuse differences in legal principles, procedures and processes in different countries. This can be prevented through deeper coordination and understanding between governments with Joint operations, intelligence coordination and extradition.
- India also stressed the need for a uniform understanding of new finance technologies due to the changing dynamics of terrorism in light of advancing technology.
 - New kinds of technology are being used for terror financing and recruitment. Challenges from the dark net, private currencies and more are emerging.

Efforts undertaken by the government in India to combat terrorism

- **National Investing Agency (NIA):** In the wake of the Mumbai terror attack in 2008, the National Investigation Agency (NIA) was established through the NIA Act, 2008.
 - NIA is currently functioning as the Central Counter Terrorism Law Enforcement Agency in India.
- **Terror Funding and Fake Currency (TFFC) division:** A Terror Funding and Fake Currency (TFFC) division has been set up in NIA to conduct focused investigations of terror funding and fake currency cases.
- Strengthening and enhancing the provisions of various terrorism-related legislations in the country such as the **Unlawful Activities (Prevention) Act, 1967** through amendments.
- Enhancing security at the international borders through the use of advanced surveillance technology, deploying additional manpower, round-the-clock surveillance, and intensive patrolling.
- Intelligence and security agencies of both the Union and States working in tandem to keep a check on terror funding activities.
- Increased training programmes for the State Police personnel on various issues.
- Thorough and effective implementation of various global standards set by international organisations agencies such as UNSC and FATF.

Mechanisms available to counter terror financing at a global level

- **Financial Action Task Force (FATF):** FATF came into existence through the G-7 Summit that was held in Paris in 1989.
 - FATF is entrusted with the task of examining money laundering techniques and trends and reviewing the actions undertaken by respective governments.
- **Interpol:** Interpol is the world's largest international police organization which was established in 1923.
 - Interpol currently has over 194 member countries and it enables cross-border police cooperation and supports and assists all organisations, authorities and services whose mission is to prevent or combat international crime.
 - The 90th General Assembly of Interpol was hosted by India recently.
- **UN Security Council Counter-Terrorism Committee Executive Directorate (CTED):** CTED is a Special Political Mission that was established by the UN Security Council in 2004 to assist the work of the Counter-Terrorism Committee (CTC) and coordinate the process of monitoring the implementation of resolution 1373 (2001) which was a counterterrorism measure passed following the 9/11 terrorist attacks on the US.
- **United Nations Office of Counter-Terrorism (UNOCT):** The United Nations Office of Counter-Terrorism (UNOCT) was established in 2017.

Nut Graf: India in recent 'No Money for Terror' Ministerial Conference on Counter-Terrorism reiterated its position that all countries will have to agree on one common definition of "terrorism" and "terror financing" and proposed a permanent secretariat in order to sustain the continued global focus on countering the financing of terrorism."

2. Indian Air Force needs a new doctrine

Syllabus: Various security forces and their mandate.

Mains: Indian Air Force Doctrine.

Details:

- Due to the Atmanirbhar Bharat campaign, there is a lot of improvement in the field of Defence inventory. However, there are certain issues associated with the Indian Air Force (IAF) doctrine.
- The doctrine is defined as 'the best way of doing a thing'. It involves various inputs like past experience, present capability, technological research and development capacity, human resource availability, and an organizational environment.

Issues with Indian Air Force Doctrine and Way Ahead:

- The IAF doctrine has become old as it was devised in 2012. It needs to be reviewed and made public for the future development of India's air power.
- The incorporation of ongoing advancement in the field of technology like artificial intelligence, machine learning, etc. remains elusive in the current scenario.

- Space will be a major player in future conflicts due to the weaponization of space. It should be noted that the experiences of the past centuries show that the force that occupies a 'higher ground' is in an advantageous position. Thus the roles and missions of the IAF should be reassessed. It is necessary to emphasize unmanned platforms and space assets including satellite capabilities.
- IAF's future needs a doctrinal foundation because of its niche strike capability, Airborne Intelligence, Surveillance and Reconnaissance (ISR), and precision attack capabilities.
- India faces a two-front threat from its neighbours (China and Pakistan).
- IAF will be a crucial component in multi-domain power synchronization that involves operations related to cyber, space, electromagnetic spectrum, etc. to meet national objectives.
- The IAF's new doctrine should accept and acknowledge the fact that to encourage new thoughts and strengthen, the human resource personnel should feel secure.
- The new IAF doctrine should also highlight that 'national defence' is a national endeavour and there should be little political interference from the higher authorities.
- Importance should also be given to combat enablers like Airborne Warning and Control Systems, transport and helicopter fleets, radars, communication systems, aerial refuellers, etc. apart from focusing only on fighter aircraft.
 - These are also vital for humanitarian assistance and disaster relief operations that are essential for military diplomacy and foreign policy.

Nut Graf: The security environment is challenging in the present scenario and the Indian Air Force doctrine needs to be reassessed. It is not only important in terms of security aspects but also for the military diplomacy and foreign policy of India.

3. National Investigation Agency (NIA)

Syllabus: Various Security forces and agencies and their mandate.

Prelims: National Investigation Agency (NIA)

Context : Recently the National Investigation Agency (NIA) has taken over the probe into the killing of a tailor in Udaipur (Rajasthan) over a social media post and murder of pharmacist Umesh Kolhe in Maharashtra.

About National Investigation Agency (NIA):

The NIA Act makes the National Investigation Agency the only truly federal agency in the country, along the lines of the FBI in the United States, more powerful than the CBI. It gives the NIA powers to take *suo motu* cognisance of terror activities in any part of India and register a case, to enter any state without permission from the state government, and to investigate and arrest people.

- It came into force after the Parliament passed the National Investigation Agency Act 2008.
- The agency investigates terror offences, waging war against the country, offences on nuclear facilities, etc.

- The NIA can investigate terror cases across the country without having to get permission from the states.
- It came into force after the Parliament passed the National Investigation Agency Act 2008.
- The agency's aim is to become a professional investigating agency matching global standards.
- It also aims at being a deterrent for existing and potential terrorists, apart from being a storehouse of information on terrorism.
- The NIA functions under the Ministry of Home Affairs. It is headquartered in New Delhi and has 8 regional offices across India.
- It maintains the 'NIA Most Wanted List'.

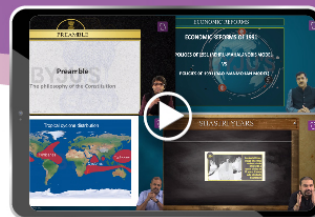
NIA (Amendment) Act, 2019:

This Amendment has made a few major changes to the original NIA Act of 2008. The changes are discussed below:

- The amendment allows the agency to investigate the following new offences as well:
 - Human trafficking
 - Counterfeit currency or bank notes related offences
 - Sale or manufacture of prohibited arms
 - Offences under the Explosive Substances Act, 1908
 - Cyber terrorism
- The amendment also expands the jurisdiction of the NIA. Now, it has the authority to investigate offences that are committed outside Indian territory subject to international treaties and domestic laws of other nations.
- The amendment also allows the central government to constitute Special Courts to conduct trials of scheduled offences.

IAS टेबलेट कार्यक्रम

सर्वोत्तम व्याख्यान की
कहीं भी और कभी भी उपलब्धता



500 से अधिक घंटों का प्रारंभिक और मुख्य परीक्षा के पाठ्यक्रम को आवृत करता हुआ व्याख्यान



हमारे मार्गदर्शकों द्वारा प्रत्येक छात्र हेतु मार्गदर्शन और व्यक्तिगत प्रतिपुष्टि



मानक पुस्तकों सहित समग्र और अद्यतन अध्ययन सामग्री



पुनरीक्षण नोट्स के साथ चर्चित मुद्दों पर सप्ताह में दो बार लाइव वेबिनार व्याख्यान



साप्ताहिक वेबिनार, चर्चित मुद्दे, समसामयिकी पत्र/पत्रिका और प्रैक्टिस सेट का छात्र पोर्टल उपलब्ध

ENVIRONMENT AND ECOLOGY

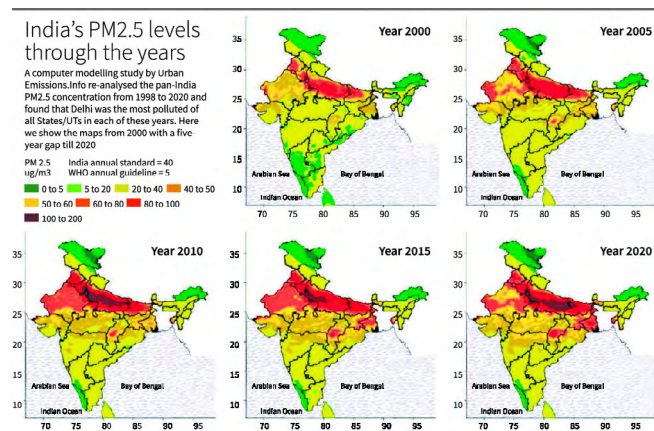
1. Air pollution issue

Syllabus: Conservation, environmental pollution and degradation

Prelims: National Ambient Air Quality Standards (NAAQS), Air Quality Index (AQI), Graded Response Action Plan (GRAP) and Central Pollution Control Board (CPCB)

Mains: Key reasons for the high pollution levels in Delhi and the evaluation of the measures undertaken to address the issue.

Context: With the onset of the winter season in the country, Delhi is once again witnessing very poor air quality and the city is being covered by a haze of smog.



Source: The Hindu

Various measures undertaken in the past to address the issue

- In 1995, the Supreme Court, while hearing a plea about the polluting industries in Delhi by an environmentalist M.C. Mehta, said that Delhi was the **fourth most polluted city** in the world with respect to the concentration of **suspended particulate matter (SPM)** in the ambient atmosphere according to the **World Health Organization's 1989 report**.
- The Apex Court further pointed out **two main polluting factors** namely the **vehicles and industries** and had also ordered the closedown and relocation of about 1,300 highly-polluting industries away from Delhi's residential areas in a phased manner.
- Later in 1996, the **Centre for Science and Environment** published a report about Delhi's air pollution which resulted in the Supreme Court (SC) issuing a notice to the Delhi government to come up with an "action plan" to curb pollution.
- After the Delhi government submitted an action plan, the Supreme Court acknowledged that there was a need for technical assistance in decision-making and implementation of its orders and sought the then Ministry of Environment and Forests to establish an authority for Delhi which led to the establishment of the **Environmental Pollution Control Authority of Delhi NCR (EPCA)** in 1998.

- The EPCA submitted a report which also had a two-year action plan following which the SC directed the Delhi Transport Corporation (DTC) bus fleet, autos and taxis to shift to Compressed Natural Gas (CNG).

- During the late 1990s and early 2000s a series of measures were undertaken such as phasing out of leaded petrol, removal of 15 and 17-year-old commercial vehicles, a restriction of 55,000 on the number of two-stroke engine auto rickshaws and conversion of coal-based power plants to gas-based plants.
- Further, the Centre set up a network of monitoring stations under the **National Air Quality Monitoring Programme (NAMP)** to measure key pollutants and pollutants like **PM10, sulphur dioxide and nitrogen oxides** were measured under the **National Ambient Air Quality Standards (NAAQS)** as specified by the Central Pollution Control Board (CPCB).

Trends in the pollution levels

- The NAAQS was revised in 2009 to cover 12 more categories of pollutants including **PM2.5**.
 - Particulate Matter or PM is mainly generated due to fuel combustion from different sources such as transport, energy, households, industry and agriculture.
 - PM2.5 is the particulate matter with a diameter under 2.5 microns and is said to be a noxious pollutant as it can penetrate into the lungs and even enter the bloodstream causing severe cardiovascular and respiratory problems.
- As per the revised NAAQS, the acceptable annual limit for PM2.5 is 40 micrograms/cubic metre (ug/m3) and 60 ug/m3 for PM10.
 - However, it is to be noted that the WHO standards prescribe an accepted annual average of 5 ug/m3 for PM2.5 and 15 ug/m3 for PM10.
- As per a study by UrbanEmissions.Info on PM2.5 concentration from 1998 to 2020 at a pan-India level, Delhi was found to be the most polluted of all States/UTs each year.
 - The study also noted that Delhi's yearly PM2.5 levels rose by about 40% from 80 g/m3 to 111 g/m3.
- Additionally, a study by the U.S.-based Health Effects Institute which analysed data between 2010 and 2019, also said that Delhi was the most polluted city in the world in terms of PM2.5 levels.
- During the winter season of 2016, Delhi experienced one of its worst-ever pollution-induced smog, with PM2.5 and PM10 levels crossing the 999 ug/m3 in a few areas of Delhi.
- The SC asked the Delhi and NCR authorities to devise a plan to deal with the air pollution, and the MoEFCC in 2017 announced the **Graded Response Action Plan (GRAP)**, which highlighted the importance of coordination between various agencies to implement pollution control measures and increase the **Air Quality Index (AQI)** levels.

Reasons for high pollution in Delhi

- As per the **Delhi Pollution Control Committee's (DPCC) 2019 report** by experts from IIT Delhi and Madras, high concentrations of air pollutants like PM_{2.5}, PM₁₀, nitrogen oxides, sulphur dioxide, carbon monoxide, and ozone in Delhi were attributed to:
 - **Rapid increase in the population:** As of 2011, the population of Delhi and NCR region stand at 25.8 million which accounts for 7.6% of India's urban population.
 - Delhi has witnessed a population growth from 1.378 crore in 2001 to 1.678 crore in 2011.
 - Further, the population density increased from 9,340 persons per sq km in 2001 to 11,320 persons per sq km in 2011.
 - **Industrialisation and urbanisation:** Despite the relocation of polluting industries away from Delhi, the Delhi-NCR region still remains one of the biggest clusters of small-scale industries.
 - **Increase in the number of private vehicles:** The number of registered vehicles in Delhi has increased from about 4.2 million motor vehicles in 2004 to about 10.9 million by 2018.
- According to UrbanEmissions.Info, the percentage of vehicular exhaust causing PM_{2.5} pollution has increased by about 30%, the soil and road dust by 20%, biomass burning by 20%, industries by 15%, diesel generators by 10%, power plants by 5% and the percentage of pollution from outside Delhi's urban airshed due to practices like stubble burning in neighbouring States has also increased by about 30%.

Evaluation of the measures undertaken and the way forward

- Various studies have revealed that the policy approach and measures undertaken both by the Union and State authorities over the years have been fragmented and reactive
- Environment regulators of India have inadequate health expertise in decision-making groups/entities. According to reports, health sector representatives constitute less than 5% of the membership of State Pollution Control Boards (SPCB).
 - The recently constituted institution, the Commission for Air Quality Management also lacks health representation.
- There exists a combination of the isolated nature of policymaking and an insufficient understanding of health among policymakers. This results in little knowledge in society about the harmful effect of air pollution.
- The air pollution policy of India by far has been treated as one of the several equally relevant facets in decision-making. This approach needs to be transformed and health should be made a feature and eventually a function of air pollution policy.
- Measures such as the shift to CNG have not yielded the intended results as the levels of SPM and PM₁₀ dropped marginally whereas the carbon monoxide levels have increased.
- The SC's restriction on two-stroke auto rickshaws also has not been successful as it impeded the sector's growth, led to black marketing of permits and increase in the number of private vehicles.

- Experts have also highlighted loopholes in policies such as the odd-even vehicular rationing rule applying only to private passenger vehicles which accounted for very few emissions and heavy freight vehicles which caused largescale pollution were left out.

Way forward

- Experts suggest that coordinated actions have to be initiated which take into account Delhi's waste management to reduce air pollution as the accumulation of waste and overflowing landfills have led to the practice of burning waste around residential areas.
- Further, airshed management, improved machinery subsidies from the government and alternatives to crop burning are seen as viable solutions to address the problems of stubble burning in the neighbouring States of Delhi.
- The National Ambient Air Quality Standards (NAAQS) review process has largely remained opaque over the years. This should be revised and health aspects should be foregrounded in such a process. This would mean that standards would be determined by local conditions as well as the impact of exposure on the vulnerable population.
- The mandate of the State Pollution Control Boards on environmental issues requires adequate and appropriate capacity, expertise, and vision for making sustained and substantial gains in air quality management.
- Air pollution has become a major cause of concern in India but the policies associated with it are marred by specific issues, particularly in the context of health aspects. Health and basic science should be made central to air pollution policies for a sustainable and effective solution.

Nut graf: As Delhi experiencing high pollution levels in winter months has become an annually recurring phenomenon, experts opine that it is important to realise that a large proportion of the polluting sources are present all around the year which is only aggravated due to unfavourable meteorological conditions in winter months and thus stop-gap and seasonal approaches must be done away with as they yield unsatisfactory results.

2. COP27

Syllabus: Conservation, environmental pollution and degradation

Prelims: About COP27 and United Nations Framework Convention on Climate Change (UNFCCC)

Mains: Issues with the existing global energy inequalities and its possible solutions at COP27

Context: The 27th Conference of Parties (COP27) of the United Nations Framework Convention on Climate Change (UNFCCC)

Details

- The 27th round of the Conference of Parties (COP27) took place in Sharm El-Sheikh, Egypt from 6 November to 18 November 2022. The leaders from nearly 200 countries will attend the event and will deliberate on global actions against the rising threat of climate change.
- COP27 saw nearly 45,000 participants, including indigenous peoples, civil society, youth and children.
- The annual summit took place at a time when the world is already reeling under the pressure of inflation, food, energy, and supply chain crises due to the Russia-Ukraine war. These situations are further worsened by extreme weather events thus highlighting that the world is not doing enough to tackle climate change.
- At COP27, deliberations and discussions were held on matters like measures to decarbonize, finance climate action, and several other issues associated with biodiversity, food, and energy security.

Key takeaways of the COP27 summit

- The United Nations Secretary-General Antonio Guterres during the COP27 summit has reiterated the fact that the world at present faces a stark choice of working together to reduce emissions or condemn future generations to climate catastrophe.
- According to the UN Secretary-General, "Humanity has a choice: cooperate or perish".
- He also noted that the progress made to save the planet from excessive warming has been inadequate as countries have been very slow or hesitant to act despite decades of climate talks.
- The UN Secretary-General urged for a pact between the developed and the poorest countries to increase the efforts for shifting away from fossil fuels.
 - He also urged the richer countries to ensure adequate funding for poorer countries in order to reduce emissions and adapt to the climate change impacts.
- He further added that the U.S. and China being the two largest economies have a particular responsibility to make this pact a reality.
- However, speaking during the summit the President of the UAE said that his country, being a member of the Organization of the Petroleum Exporting Countries (OPEC), will continue to produce fossil fuels until there is a need.
 - These comments of the UAE's President have gained prominence as the UAE will be hosting the 28th session of the Conference of Parties (COP 28) in 2023.
- Countries at COP27 agreed to set up a fund to compensate the most vulnerable countries from climate-linked disasters.
- Crucial questions with respect to the fund have been left to a "transitional committee" that will make recommendations for the adoption of the fund at the next Conference of the Parties (COP).
- A summary document of all the major decisions taken, called the Sharm el-Sheikh Implementation Plan, highlighted that a global transformation to a low-carbon economy is expected to require investments of at least \$4-6 trillion a year.

India at COP27

- India announced its long-term strategy to transition into a "low-emission" track at COP27. This approach is premised on increasing its nuclear power capacity by at least threefold in the next decade, becoming an international hub for green hydrogen production and raising the proportion of ethanol in petrol.
- This approach is in line with India's "five-decade journey" to net zero emissions or becoming carbon neutral by 2070 as proposed by India in COP26.
- All 195 countries that are signatories to UN climate agreements are obliged to submit the long-term documents by 2022. However, only 57 countries have done it so far.
- **India's Long Term-Low Emission Development Strategy (LT-LEDS)** has been formulated aligned with India's right to an equitable and fair share of the global carbon budget. It has been ensured that the strategy emphasizes energy security, energy accessibility, and employment while focussing on the vision of Atmanirbhar Bharat.

Elements of India's Low Emission Strategy:

- The LT-LEDS are qualitative approaches and emanated as a requirement from the 2015 Paris Agreement. The countries are mandated to explain their strategy of transitioning their economies beyond achieving near-term NDC targets and working towards the climate objective of reducing emissions by 45% by 2030 and achieving a net zero target by 2050.
- The Long-Term Low-Carbon Development Strategy underlines India's approach focusing on the use of nuclear power and hydrogen to transition India into a carbon-neutral economy.
- The strategy also highlights India's right to a fair and equitable share of the global carbon budget.

At COP-27, India insists on higher target by 2024

- At the UN climate summit COP-27, India has highlighted that developing countries require enhancements in climate finance beyond the commitment of \$100 billion a year to meet their ambitious goals and the developed countries must lead the mobilisation of resources.
 - At the COP-15 held in Copenhagen in 2009, the developed/rich countries had jointly committed to mobilising \$100 billion a year by 2020 to help developing countries address and mitigate the effects of climate change.
- However, it is said that the developed countries have failed to deliver this finance and developing nations such as India, are pushing developed countries to commit to a new global climate finance target which is also known as the New Collective Quantified Goal on Climate finance (NCQG).
- The Indian delegation at COP27 has said that climate actions to meet the Nationally Determined Contributions (NDC) targets need financial, technological, and capacity-building support from developed countries.

- Highlighting the work of the Intergovernmental Panel on Climate Change (IPCC), India has said that developed countries are the major contributors of the carbon stock in the atmosphere and the fact underlies the importance of the core principles of the UNFCCC and its Paris Agreement namely equity and “common but differentiated responsibilities and respective capabilities”.

Associated Challenges:

- COP-27 was termed an “implementation conference” because the countries were determined to solve outstanding questions on climate finance and failed to devise any new solution or new assurances.
- It should be noted that out of the \$100 billion annual commitments that were mooted in 2009 and formalized in 2020, less than a third has been pooled till now.
- There is a demand that developed countries should propose new targets, described in negotiations as a New Collective Quantified Goal. It demands a clear approach to delivery with a higher amount in the tune of “trillions of dollars” to account for the increased costs of the energy transition.
- Another major concern is the Loss and Damage (L&D) aspect. This aims to compensate the most vulnerable countries and developing countries that face the highest brunt of climate change for the damage that has already been incurred.
- However, the European Union was reluctant to announce a fund this year as these would take years to materialize and there is the availability of other alternatives to get money flowing where it was most needed.

Nut graf: *At a time when the Russia-Ukraine war, rampant consumer inflation and energy shortages are taking the centre stage in global geopolitics, the world is fast approaching tipping points that will make climate chaos irreversible. As a result, there is an immediate need for the world to cooperate together and act quickly to address the far-reaching adverse effects of climate change.*

3. Invasive tree spreading in Mudumalai Tiger Reserve

Syllabus: Environment and Biodiversity

Prelims: Senna spectabilis and Mudumalai Tiger Reserve

Context:

- An invasive species named Senna spectabilis is said to have taken over 800 to 1,200 hectares of the buffer zones of the Mudumalai Tiger Reserve in Tamil Nadu.

Details:

- In recent years, bright yellow flowers of Senna spectabilis have become more prominent in the Tiger Reserve.
- As per conservationists, the invasive plant will have adverse effects on local biodiversity as it crowds out native species and limits food availability for wildlife.
- Senna spectabilis and Lantana camara are among five major invasive weeds that have taken over the Nilgiri forests and are affecting the local biodiversity.

- Eucalyptus and pine are also considered exotic and invasive but do not spread as fast as the other species and are considered easier to manage.
- According to the Forest Department officials, policy-level discussions are taking place on the prospects of Tamil Nadu Newsprint and Papers Limited (TNPL) using the wood from Senna spectabilis for paper-making and efforts are underway by the Forest Department to devise a 10-year-plan to systematically remove Lantana camara.

Senna spectabilis:



Source: india.wcs.org

- Senna spectabilis is an exotic tree species belonging to the Fabaceae family.
- Senna spectabilis is native to South and Central America and other parts of tropical America.
- Senna spectabilis is used as an ornamental tree and is also used for firewood.
- The species is known for its bright yellow flowers that bloom during the summer months and hence it is also regarded as “golden wonder tree”.
- Senna spectabilis has been commonly used in traditional medicine and it is known to have antibacterial, antibiofilm, antifungal and antioxidant properties.
- However, Senna spectabilis is considered an invasive species in places like India, Australia, Uganda, and Cuba as it is very hardy, survives under extreme conditions, and eradicating it from a landscape is a challenging task which can take years.
- It is considered an environmental weed by the Global Compendium of Weeds as it grows extremely fast, flowers and sets seed profusely, and re-sprouts immediately when cut.

4. The International Day for Biosphere Reserves

Syllabus: Biodiversity conservation

Prelims: Biosphere reserves of India

Mains: Importance of Biosphere Reserves

Context:

- The first ‘International Day for Biosphere Reserves’ will be celebrated on November 03, 2022.

Introduction:

- November 03, 2022, will be observed as the first International Day for Biosphere Reserves. It was proclaimed by the UNESCO General Conference in its 41st session in 2021.

- The event will be organised at UNESCO Headquarters in Paris and in collaboration with all the regions of the World Network of Biosphere Reserves.
- This will also mark the end of the two years celebration of the 50th anniversary of the Man and the Biosphere (MAB) Programme.
- The purpose of the International Day for Biosphere Reserves is to provide an annual wake-up call on the sustainable development approach to modern life and the leading and exemplary role that the World Network of Biosphere Reserves (WNBR) can play in this regard.

Man and the Biosphere (MAB) Programme:

- The MAB programme is an intergovernmental scientific programme launched in 1971 by UNESCO that aims to establish a scientific basis for enhancing the relationship between people and their environments.
- It combines the natural and social sciences with a view to improving human livelihoods and safeguarding natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate and environmentally sustainable.
- The World Network of Biosphere Reserves (WNBR) of the MAB Programme consists of a dynamic and interactive network of sites of excellence which fosters the harmonious integration of people and nature for sustainable development through participatory dialogue; knowledge sharing; poverty reduction and human well-being improvements; respect for cultural values and society's ability to cope with change – thus contributing to achieving the Sustainable Development Goals (SDGs).
- The World Network of Biosphere Reserves currently counts 738 sites in 134 countries all over the world, including 22 transboundary sites.
 - More than 260 million people live in biosphere reserves across the world.
 - 12 of the 18 biosphere reserves in India have become part of the World Network of Biosphere Reserves.
 - Sri Lanka has 04 and Maldives has 03 biospheres.
 - Bangladesh, Bhutan, and Nepal do not have any notified biospheres yet.

Significance of Biosphere Reserves:

- The World Network of Biosphere Reserves promotes North-South and South-South collaboration and represents a unique tool for international cooperation through sharing knowledge, exchanging experiences, building capacity and promoting best practices.
- This gains significance as the ecological carrying capacity of the planet earth has been exceeded.
- Ecosystem and theme-specific networks provide valuable insights into sustainable development models and climate change mitigation and adaptation possibilities.
- In the more than 700 UNESCO biosphere reserves, a different relationship between humans and their environment – a relationship founded on ethics and respect, with a great emphasis on indigenous and local knowledge is being created and put into practice on a daily basis.

Opportunities in South Asia:

- Over 30 biosphere reserves have been established so far in South Asia.
 - The first one was the Hurulu Biosphere Reserve, in Sri Lanka, with 25,500 hectares of tropical dry evergreen forest.
 - The Nilgiri Biosphere Reserve was the first biosphere reserve in India established in 1986. It is located in the Western Ghats and includes 2 of the 10 biogeographical provinces of India.
- South Asia offers numerous options for biosphere reserves considering the massive long-term threats to human survivability such as biodiversity loss, climate change, pollution and population dynamics.
- South Asia has a very diverse set of ecosystems, with Bhutan, India, and Nepal combined having thousands of glaciers, surrounded by lakes and alpine ecosystems.
- With a focus on north-eastern states, India also provides unlimited opportunities for biosphere reserves.

Way Forward:

- Strong political will in South Asian countries towards having biosphere reserves is necessary.
- To address the issues of lack of know-how and financial resources, more financial support from the richer nations and the private sector would be desirable.
- The existence of the new World Network of Mountain Biosphere Reserves provides a welcome opportunity for Bhutan and Nepal to establish their first biosphere reserves and participate in the world network.
- At least one biosphere reserve per country in Bangladesh, Bhutan and Nepal until 2025 (with additional biosphere reserves in India's North-East and along the coasts) will give realisation to millions of people for a better future where we will truly live in harmony with nature.

Nut Graf:

November 03, 2022, will be observed as the first International Day for Biosphere Reserves to showcase the contribution of the biosphere reserves to sustainable development. Expanding biosphere reserves across the world, especially in Asia, will help realise the objectives and goals of the MAB Programme and SDGs.

5. Climate action

Syllabus: International Environment Agencies & Agreements

Mains: Policies to combat Climate Change

Context:

- Vanuatu backs fossil fuel non-proliferation treaty at UN General Assembly.

Introduction:

- Vanuatu, a Pacific island nation, has called on countries at the UN General Assembly to sign up for a fossil fuel non-proliferation treaty, ending all new coal, oil and gas projects and phasing out existing ones.
- It is the first country to call for such a treaty. The Vatican, the UN Secretary-General and the World Health Organization have all backed ending fossil fuel production worldwide.

- A similar call on coal use was made at the COP26, Glasgow.
 - The language of the decision at Glasgow was toned down from 'phaseout' to 'phase down' of unabated coal power and inefficient fuel subsidies after a strong protest by several countries, especially India who argued that the phaseout was unfair to countries that were heavily dependent on coal power in the medium term.
- Vanuatu also urged global leaders to support its campaign to request an advisory opinion from the International Court of Justice (ICJ) on countries' legal obligations to protect people from climate harm.
 - Comprising more than 80 islands stretching across 1,300km, Vanuatu is highly vulnerable to rising sea levels and intense cyclones.
- Palau and the Marshall Islands previously tried to request a similar advisory opinion from the ICJ in 2012, but failed to secure a majority.
- This could inform climate lawsuits around the world and strengthen vulnerable countries' calls for more support at international negotiations.

Road Ahead:

- The unsustainable levels of natural resource consumption and the extravagant lifestyles led by consumers in developed economies account for a sizable portion of the increase in global emissions.
 - The Lifestyle for Environment (LiFE) movement recently initiated by India assumes importance in this context.
- There are other methods to lower world emissions besides coal phasedown. In many countries, including India, coal is the principal source of energy and the fundamental and integral part of their energy system.
 - Reducing coal-fired power may create several difficulties in securing the progress of developing economies towards key sustainable development goals.
- The transition to a world of lower emissions has to be sustainable and equitable.
 - The transition must ensure equal access to energy and secure energy supplies for all.
- Building climate-resilient infrastructure in developing countries must be given high priority.
- More investment in energy innovations and alternative technologies is necessary along with phasing down the fossil fuel use in the energy mix.

Treaty v/s Convention:

- The call to end fossil fuels through a mandate in the UN has very different implications than when it is presented under the UN Climate Change Convention.
- A UN mandate of this nature is divorced from the legal responsibility of the developed countries to reduce their emissions on the basis of responsibility, capability and national circumstances, as required by the Climate Change Convention.
- It also makes no provisions for technological and financial innovations that are necessary to ensure the transition.
- A few months ago, the UN Security Council rejected a draft resolution that would have integrated climate-related security risk as a central component of United Nations conflict-prevention strategies aiming to help counter the risk of conflict relapse.
 - This was due to the opposition of most of the global south, which saw in this an attempt to address climate change not through international cooperation and consensus but by imposing the wish of a select few on others.

Significance of this plea:

- Vanuatu represents a strong and vocal group of small island developing states whose voice is heard with attention and empathy in the UN as the matter will affect the global discourse on climate change.
- The small island group has gone around seeking endorsements from various quarters — governments, the corporate world and civil society.
 - The Mayor of Kolkata, the capital of one of the largest coal-producing States in India, has lent his voice of support.
- This call for a treaty has started discussions around the issue ahead of COP27 in Egypt.
- If a majority of countries at the UN general assembly give the ICJ a mandate to act, the court will be tasked with interpreting what international human rights and environmental laws mean for countries' responsibility to act on the causes and impacts of climate change.
 - The UN general assembly is one of the few bodies authorised to request advisory opinions from the ICJ, which settles legal disputes between countries.

Nut Graf:

Recent call for fossil fuel non-proliferation treaty by Vanuatu assumes significance ahead of COP 27 in Sharm El Sheikh in Egypt. Ongoing energy stress in Europe due to the Russia-Ukraine crisis has dented countries' ability to reduce emissions. Addressing the adverse impacts of climate change and preparing the vulnerable population for an uncertain future assumes priority.

6. Blue flag certification

Syllabus: Conservation

Prelims: Blue Flag certification

Context: Two more Indian beaches were recently given blue flag certification.

What is Blue Flag?

- It can be defined as an **ecolabel or certificate given to beaches, marinas, and sustainable boating tourism operators** by the **Foundation for Environmental Education (FEE)**.
- It is a **badge of environmental honour** given to coastal locations around the world for meeting and maintaining stringent environmental, educational, safety, and accessibility criteria.
- The certification is awarded on compliance of **33 criterias** which are grouped under following **four categories**:
 - **Environmental Education and Information**
 - **Water Quality**
 - **Environmental Management**
 - **Safety and Services**

Blue Flag Beaches in India:

1. Shivrajpur in Gujarat's Devbhumi Dwarka district
2. Ghogla beach in Diu
3. Kasarkod (Uttara Kannada) in Karnataka
4. Padubidri (Udupi) in Karnataka
5. Kappad (Kozhikode) in Kerala
6. Eden beach in Puducherry
7. Kovalam (Chennai) in Tamil Nadu
8. Rushikonda (Visakhapatnam) in Andhra Pradesh
9. Golden beach in Puri, Odisha;
10. Radhanagar Swarajdeep in Andaman and Nicobar.
11. **Minicoy Thundi beach in Lakshadweep**
12. **Kadmat beach in Lakshadweep**



Figure: Blue Flag Beaches in India
Source: The Hindu

- Minicoy Thundi beach and Kadmat beach, both of which are located in Lakshadweep are the latest additions to the list of beaches with Blue flag certification in India.
- Kovalam and Eden were awarded the Blue Flag certification in 2021 whereas the rest of the eight beaches got the certification in 2020.

Significance:

- Blue star certified beaches are **considered to be among the cleanest beaches in the world**. This blue star recognition will help these beaches in India in attracting the tourists across the world.
- It is recognition of the efforts made by the government for sustainable development of coastal regions.

7. Is climate change affecting global health?

Syllabus: Environmental pollution and degradation

Mains: Key findings of the 2022 Lancet Countdown on Health and Climate Change report and important recommendations of the report.

Context

- The 2022 Lancet Countdown on Health and Climate Change: Health at the Mercy of Fossil Fuels report has highlighted that global reliance on fossil fuels will increase the risk of diseases, food insecurity and other heat-related illnesses.

Important findings of the report

- **Link between climate change and public health:** At a time when the world is facing the brunt of climate change, the latest Lancet report has outlined the intimate relationship between changing weather phenomena and their impact on the health of people.
- **Global reliance on fossil fuels:** In the wake of the Russia-Ukraine war, several countries have initiated efforts to shift to alternative fuels to Russian oil and gas, and a few are still turning back to traditional thermal energy.
 - The report suggests that even this temporary transition or the renewed push towards coal for energy requirements could reverse the gains made in air quality improvement and accelerate climate change threatening human survival.
- **Increase in infectious diseases:** Climate change has had a significant impact on the spread of infectious diseases and has increased the risk of emerging diseases and co-epidemics.
 - **Example:** as the coastal waters have become more suited for the transmission of *Vibrio* pathogens, the number of months suitable for malaria transmission has also increased in several highland areas of America and Africa.
 - Additionally, according to WHO, climate change is expected to result in about 2,50,000 additional deaths per year due to malnutrition, malaria, diarrhoea and heat stress between 2030 and 2050.
- **Food insecurity:** As per the report, climate change has adversely impacted every aspect of food security as higher temperatures (due to global warming) affect crop yields as the growth season has been shortened for many cereal crops.
 - Extreme weather events also disrupt supply chains which affect the availability, access, stability, and utilisation of food thereby increasing the prevalence of undernourishment.
 - Undernourishment has increased significantly due to the COVID-19 pandemic, as about 161 million more people face hunger in 2020 than in 2019. This situation has been further aggravated by the Russia-Ukraine war.
- **Heatwaves:** The report further notes that the rapidly increasing temperatures due to climate change have exposed people, particularly the vulnerable populations (adults above 65 years old and children below one year) to nearly 3.7 billion more heatwave days in 2021 than annually in 1986–2005.

Recommendations

- The report highlights the importance of a transition to clean energy sources for the future instead of shifting towards traditional thermal energy sources such as coal.
- The report states that a health-centred response to the coexisting climate, energy, and cost-of-living crises provides an opportunity to deliver a healthy and low-carbon future.
 - Health-centred responses would further reduce the risks of catastrophic impacts of climate change while also improving energy security and providing an opportunity for economic recovery.

- Further, betterments in air quality will aid in preventing the deaths caused due to exposure to fossil fuel-derived ambient PM_{2.5}, and the stress on low-carbon travel.
 - An increase in urban spaces will also help in promoting physical activity which has a positive impact on physical and mental well-being.
- The report also urged for an accelerated transition to sustainable and balanced plant-based diets, as they help mitigate emissions from red meat and milk production, and also prevent diet-related deaths and the risks of zoonotic diseases.
 - Plant-based diets will help in reducing the burden of communicable and non-communicable diseases which ultimately reduces the burden on the existing healthcare facilities ensuring robust healthcare systems.

Nut graf:

In the wake of the ongoing COP27 in Egypt, the Lancet report notes that the pace and scale of climate change adaptations are still slow and insufficient and the report calls for immediate global coordination, funding and cooperation among governments, communities, civil society, and corporations to mitigate the existing vulnerabilities of climate change.

8. New crab species found in T.N.

Syllabus: Environment and Biodiversity

Prelims: Newly discovered crab species

Context:

- Researchers have discovered a new species of crab in the mangroves of Parangipettai near the Vellar river estuary in the Cuddalore district of Tamil Nadu.

Details:

- The new species of estuarine crab discovered in Tamil Nadu has been named ***Pseudohelice annamalai*** as a mark of recognition of the “Annamalai University” which has completed 100 years of service in education and research.
- This is said to be the first-ever record of the genus, *Pseudohelice* in the intertidal areas and to date, only two species namely ***Pseudohelice subquadrata*** and ***Pseudohelice latreillii*** have been confirmed within this genus.
- The discovered species is found around the Indian subcontinent and the eastern Indian Ocean.
- *Pseudohelice annamalai* is marked by dark purple to dark grey colouring, with irregular light brown, yellowish brown, or white patches on the posterior carapace with light brown chelipeds.
- *Pseudohelice annamalai* inhabits muddy banks of mangroves and links the distribution gap between the western Indian Ocean and the western Pacific Ocean.
- The newly discovered species also provides additional evidence of the geographic isolation of the eastern Indian Ocean for some marine organisms.

9. Himalayan Gray Langur

Syllabus: Environment and Biodiversity

Prelims: Himalayan Gray Langur

Context:

- A recent study published in the Journal of Threatened Taxa has found that differing elevations of habitation make one group of Himalayan Gray Langur prefer fruits and another group like flowers.

Himalayan Gray Langur:



Source: The Hindu

- The Himalayan Gray Langur or the Chamba Sacred Langur, scientifically known as *Semnopithecus ajax* is a species of colobine (leaf-eating monkeys).
- Before 2001, *Semnopithecus entellus* (Hanuman Langur) was considered only one species, with several subspecies. In 2001, these subspecies were separated as species under the genus *Semnopithecus*.
 - Accordingly, seven different species have been recognised which include *Semnopithecus ajax*.
- The Himalayan Gray Langurs are widely distributed in the Indian subcontinent across Himachal Pradesh, Jammu and Kashmir, and other parts of Pakistan and Nepal.
- The distinguishing feature of the Himalayan Grey Langur is the adult male's shoulder mane.
- The Himalayan Grey Langurs are seen in a particular area only during some parts of the year as they change their locality during different seasons, depending upon the availability of food and environmental conditions.
- IUCN Status: **Endangered**
- Wildlife Protection Act, 1972: **Schedule II**

10. Olive Ridley Turtles

Syllabus: Environment and Biodiversity

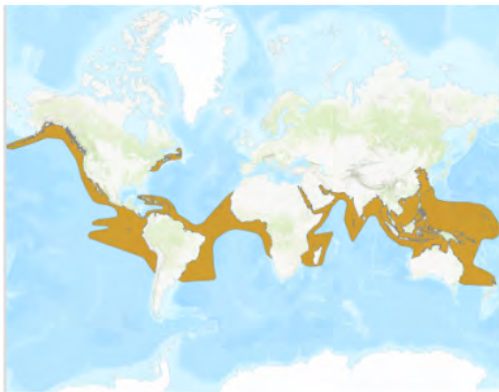
Prelims: Olive Ridley Turtles

Context:

- Pairs of Olive Ridley sea Turtles have been spotted at the sea waters off Gahirmatha beach along the Odisha coast which mark the onset of the annual mass nesting of these turtles.
- Gahirmatha beach is the world's largest rookery for Olive Ridley Turtles.

Olive Ridley Turtles:

- These species of sea turtles are named so because of the olive-green colour of their heart-shaped shells.
- The olive ridley turtles are among the smallest and most abundant sea turtles found in the world.
- Geographical range: These turtles are found in the warm waters across the Pacific, Atlantic and Indian oceans.



Source: IUCN

- Arribada is a unique phenomenon where the Olive Ridley turtles try to increase the chances of survival of their offspring.
- IUCN Status: **Vulnerable**
- Wildlife Protection Act 1972: **Schedule 1 Protection**
- CITES: **Appendix 1**
- Also listed in the Convention on Migratory Species (CMS)

11. Amur Falcon

Syllabus: Environment and Biodiversity

Prelims: About Amur Falcon

Context: Nagaland to undertake the first bird count exercise

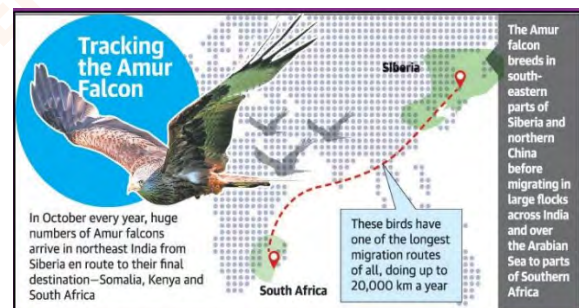
New in Detail:

- A four-day **Tokhü Emong Bird Count (TEBC)** took place in Nagaland.
- The Exercise involves **people watching and counting birds** on any or all days from November 4-7 from anywhere in Nagaland for at least 15 minutes.
- They have to then upload the names of the word on a **bird recording platform called eBird**.

- The initiative hence intends to encourage the community to celebrate the festival with birds
- It was named so because it takes place during the post-harvest **Tokhü Emong festival of the Lothas** which dominates Wokha district of Nagaland.
- **Wokha has a unique address in the world birding map as the most preferred stopover of the Amur falcons while travelling from east Asia to southern Africa.**

About Amur Falcon:

- Amur falcon (Falco amurensis) is a small **predatory bird (raptor)** which belongs to the family of falcons.
- These birds breed in south-eastern Siberia and Northern China. Then they migrate in large flocks to Southern and East Africa across India and over the Arabian Sea.
- In this process they cover 22,000-kilometres and it is one of the longest migratory routes amongst all avian species. They are hence recognised as the world's longest travelling raptors.
- Their name is derived from the **Amur River which acts as a border between Russia and China.**
- They leave the Amur river region during autumn and head southward to a warmer Africa.
- On the way they stop over the North Eastern parts of India, particularly in **Nagaland. Nagaland is hence also known as the Falcon capital of the world. The Doyang lake in Nagaland, formed due to the impounding of the waters of the River Doyang near Doyang dam region is an important stopover region for these birds,**
- They return back to Siberia, during the late spring.



Source: The Hindu

Conservation status:

- They belong to the category of the **least concern** under the International Union for Conservation of Nature (IUCN) Red List.
- They are protected under **Schedule IV of Wildlife Protection Act 1972.**
- **India is a signatory to the Convention on Migratory Species (CMS)** which aims to conserve migratory species throughout their ranges. Thus India is obliged to protect the migratory species such as Amur Falcons.

Tokhü Emong festival

- It is a harvest festival celebrated by **Lothas of Nagaland.**
- The celebration of the festival starts on the 1st week of November every year and stretches over 9 days.
- Lothas is a the Naga community that dominates Wokha district of Nagaland

12. Gangetic dolphin

Syllabus: Environment and Biodiversity

Prelims: About Gangetic dolphins

Context: Dolphins return to River Ganga as water quality improves.



Figure: Gangetic dolphin
Source: The Hindu

Gangetic river dolphins (Platanista gangetica):

- It is one of **five species of river dolphin** found around the world.
- It is found mainly in the Indian subcontinent, particularly in **GangaBrahmaputra-Meghna and Karnaphuli-Sangu river systems**.
- They are usually **blind** and they **catch their prey by emitting ultrasonic sounds**. The echo of the sound which is reflected from the prey helps the dolphin in understanding various aspects of the prey such as position, size etc.
- It is the **national aquatic animal of India**.

Five species of river dolphins are:

- Amazon river dolphin
- Tucuxi
- Irrawaddy dolphin
- Yangtze finless porpoise
- Gangetic river dolphin

Significance of Gangetic dolphin:

- Gangetic dolphins occupy the **top position in the food chain of river ganga**. They are hence keystone predators and they help control the population of species in lower levels of the food chain.
- Aquatic life of a river ecosystem is an indicator of its health. Pollution of river water results in shrinking of aquatic life in it. Hence a decline in population of gangetic dolphins indicates poor quality of river water and vice versa.

Threats to Gangetic dolphin:

- Being accidentally caught in fishing nets
- Hunting by fishermen to extract oil from their blubber. The oil is used as an attractant to catch fishes.
- Construction of dams and barrages which results in isolation and fragmentation of dolphins into small groups with limited geographical range.
- Presence of toxic pollutants such as heavy metals in the river causes the death of dolphins.

Conservation efforts:

Gangetic dolphins are classified as endangered by the International Union for the Conservation of Nature. Various conservation efforts associated with genetic dolphin are:

- **Wildlife Protection Act:** They are included in the first schedule of Wildlife Protection Act. As a result they are protected from hunting and they can be protected by establishing wildlife sanctuaries. Vikramshila Ganges Dolphin Sanctuary, in Bihar was established under this Act.
- **Project Dolphin:** Government plans to implement a Project dolphin in lines of Project Tiger.
- **Status of National Aquatic Animal:** The status of Gangetic dolphins as the national aquatic animal will provide some protection from human exploitation.

13. Indian Black Honeybee

Syllabus: Environment and Biodiversity

Prelims: About Indian Black Honeybee.

- This new species is endemic to the Western ghats and has been named **Apis Karinjodian**. The common name is **Indian Black Honeybee**.
- A new species of the honeybee has been spotted from the Western Ghats after a gap of more than 200 years. The last honeybee described from India was *Apis indica* in 1798 by Fabricius.
- Although Fabricius named the Indian bee *Apis indica*, it was not considered a valid species till now. The high-resolution photograph of the type of specimen was used to prove the distinct identity of *Apis indica* which led to the discovery of *Apis Karinjodian*.
- *Apis karinjodian* has evolved from *Apis cerana* morphotypes that got acclimatised to the hot and humid environment of the Western Ghats.
- Molecular analysis of mitochondrial DNA was also carried out and molecular sequence data available in the public open database NCBI-GenBank also helped confirm the species status of the new honeybee.
- The distribution of *Apis karinjodian* ranges from the central Western Ghats and Nilgiris to the southern Western Ghats, covering the States of Goa, Karnataka, Kerala and parts of Tamil Nadu
- IUCN status - Near Threatened

14. Snow Leopard

- A recent camera trapping has recorded the first-ever presence of a snow leopard in high altitudes of the upper Baltal-Zojila region of Kashmir.
- This has renewed hopes for Snow Leopard in the higher altitudes of Jammu and Kashmir and Ladakh.
- Camera trapping exercises by researchers from Nature Conservation Foundation (India), partnering with J&K's Department of Wildlife Protection, also raised hopes for other important and rare species such as the Asiatic ibex, brown bear and Kashmir musk deer in the upper reaches of Jammu and Kashmir and Ladakh.
- This research is part of the Union government's Snow leopard Population assessment of India (SPAI).
 - SPAI has been concluded so far in Himachal Pradesh and Uttarakhand.

- India has ratified the Global Snow Leopard and Ecosystem Protection Program (GSLEP), a high level intergovernmental alliance of all the 12 snow leopard range countries.
 - These Governments have jointly initiated an effort to conduct Population Assessment of the World's Snow Leopards, or PAWS.
 - Recognizing the importance of understanding snow leopard occurrence and status for conservation planning, the Government of India has launched India's PAWS effort, referred to here as the 'Snow Leopard Population Assessment in India (SPAI)'.
 - SPAI is expected to lead to scientifically robust national and state-wise population estimates of this endangered and elusive cat across its high altitude habitat, both inside and outside protected areas.

15. Great Knot

- A great knot from Russia, belonging to the endangered *Calidris tenuirostris* was recently seen on the Chavakkad beach, Kerala, flying over 9,000 km for a winter sojourn.
- The migratory bird traversed the Central Asian Flyway (CAF). It is only one of the two — the other has been sighted at Jamnagar in Gujarat — great knots to be re-sighted in India among the nearly thousand ones tagged with MOSKVA rings in the Kamchatka peninsula in eastern Russia.
- These long-distance migrants stay in the Yellow Sea region and Thailand in southeast Asia before proceeding to their southerly winter grounds, including Peninsular India along the CAF.
- The great knot is a small wader. It is the largest of the calidrid species.
- Their breeding habitat is tundra in northeast Siberia. They nest on the ground laying about four eggs in a ground scrape. They are strongly migratory wintering on coasts in southern Asia through to Australia. This species forms enormous flocks in winter.
- They are listed as 'Endangered' in the IUCN Red List of Threatened Species.

HEALTH ISSUES

1. Can vaccine distribution be made fairer?

Syllabus: Issues relating to management in the health sector.

Mains: Vaccine equity.

Details:

- The Global Dashboard for Vaccine Equity has highlighted that only one in four people has been vaccinated with at least one dose in low and middle-income countries (as of November 9, 2022). However, three in four people have received at least one dose of the vaccine in high-income countries.

Global Dashboard for Vaccine Equity:

- Global Dashboard for Vaccine Equity is a joint collaboration of the United Nations Development Programme (UNDP), the World Health Organization (WHO), and the University of Oxford with cooperation from the entire United Nations.
- It collects data on the global roll-out of COVID-19 vaccines with the “most recent socio-economic information to illustrate the importance of accelerating vaccine equity in saving lives as well as driving a faster and fairer recovery from the pandemic with benefits for all.”

Vaccine Equity:

- Vaccine equity means that everyone in the world has equal access to vaccines.
- However, in reality, the availability of drugs in different parts of the world is unequal, depriving large swathes of people in low and middle-income countries.
- It was perceived by many that the urgency of a pandemic might erase these differences and provide equal access to all. But this hope did not come true.
- According to a Lancet Article, the early phase of vaccine production for COVID-19 was insufficient to meet the global demand. As a result, many rich countries turned inwards, procuring vaccines for their domestic population. This came to be known as Vaccine Nationalism.
- These methods further catalyzed the global vaccine inequity which is prevalent even today.
- Another article in the same journal (Lancet) showed that “broadening gaps in global vaccine equity has led to a two-track pandemic with booster COVID-19 vaccinations proliferating in high-income countries (HICs) and first doses not yet reaching all populations in low-income countries (LICs).” This inequity was termed as ‘Vaccine Apartheid’ by the WHO Director-General Tedros Adhanom Ghebreyesus.
- The Global Dashboard also pointed out another key aspect that the vaccination programmes will increase the cost of healthcare in all countries, but the effect will be felt the most in low-income countries.
 - Low-income countries would have to increase their health expenditure by almost 30-60% to cover 70% of their population under the present pricing mechanism.

- In High-income countries this increase would be a meager 0.8% to achieve the same vaccination rate in one year.

Measures to reduce vaccine inequity:

- Efforts were initiated to waive the intellectual property protection for the COVID-19 vaccines and other ranges of therapeutics. This would ensure that affordability alone should not hamper the availability. However, these efforts could not fructify in reality.
- The COVID-19 Vaccine Delivery Partnership (COVAX) was launched. It was a collective effort of WHO, UNICEF, Gavi, and the World Bank.
 - The objective of COVAX was to accelerate COVID-19 vaccination coverage in 34 low-coverage countries.
 - It provided help to several countries in accessing vaccines. However, it was reported by WHO that low-income countries (LIC) did face difficulties in achieving a major change in vaccination rates.
 - Furthermore, if it cannot support these countries (LIC) beyond the 20% vaccination rate then the financial burden of vaccinating an additional 50% of the population would have to be borne by the respective governments. This would be a daunting challenge given that the countries are already reeling from the global economic crisis.

Conclusion:

- It is important that adequate quantities of vaccines should be made available across the world as ‘No one is safe until everyone is safe’ (WHO’s dictum).
- Cooperation among countries is particularly important at this juncture when there is a risk of new variants causing further waves of infection.

Nut Graf:

Vaccine inequity exists across the world. The low-income countries are most affected by it as the majority of the population has not received even a single dose of COVID-19 vaccination. Every country should come together to achieve equity in this aspect for the benefit of humankind.

HISTORY

1. Guru Nanak

Syllabus: Indian History- Significant personalities

Prelims: About Guru Nanak

Context:

- November 8 2022 marks the 553rd birth anniversary of Guru Nanak.

Guru Nanak:

- Guru Nanak was born on April 15, 1469, in Talwandi which is a village in western Punjab.
- However, the date of birth anniversary of Guru Nanak changes every year as his followers mark the day according to a Lunar calendar and Gurmurb or the Guru Nanak Jayanti is celebrated fifteen days after Diwali on the occasion of Karthik Purnima.
- Guru Nanak was the first Sikh Guru and is also regarded as the founder of the Sikh religion.
- As per the Sikh tradition, Guru Nanak was a blessed or illuminated soul but he is not considered an incarnation or even a prophet.
- Guru Nanak is said to have undertaken long journeys to convey his message to the people in the form of musical hymns and used the local language to convey his message.
- Guru Nanak's hymns and teachings are collected in the form of a book called the Guru Granth Sahib which is known as the "holy book of Sikhism".

2. India in World Wars

Syllabus: World Wars

Mains: Significant contribution of India in World Wars

Context:

- November 11 is observed as Remembrance Day in Commonwealth of Nations member states since the end of World War I to remember members of their armed forces who died in the line of duty. Remembrance Day is also known as Armistice Day. It marks the day World War I ended.

India's pivotal role in World Wars:

- Over one million Indian troops served overseas, of whom 62,000 died and another 67,000 were wounded. In total at least 74,187 Indian soldiers died during the war.
- In World War I the Indian Army fought against the German Empire on the Western Front.
- Indians mobilised four days after Britain declared war on Germany, with the support of nationalist leaders, including Mahatma Gandhi.
- Indians fought with valour and distinction in the trenches of Europe, West Asia and North Africa.

- Indian soldiers won a total of 11 Victoria Crosses for their sacrifice in World War I. Khudadad Khan became the first Indian to be awarded a Victoria Cross. He was a machine gunner with the 129th Baluchi Regiment.
 - The Victoria Cross is the highest award for gallantry that a British and Commonwealth serviceman can achieve.
- As high as 100 million British Pounds (present-day Rs 838 crore) was gifted by India to Britain to fund their war anticipating dominion status and home rule in return.
- As much as 37 lakh tonnes of supplies and jute for sandbags were sourced by the British from India. India supplied all sorts of material for the war, including clothing, weaponry including tanks, armoured cars, guns, etc.
- The British raised men and money from India, as well as large supplies of food, cash, and ammunition, collected by British taxation policies.
- India raised the largest ever volunteer army, of 2.5 million, for the Second World War.
- More than 87,000 of those men are cremated or buried in war cemeteries around the world and in India.
- Indian doctors and nurses were deeply involved on British soil and in other countries. In 1939, the Indian Comforts Fund (ICF) was established at India House in Aldwych that was run by Indian and British women.
 - Between 1939 and 1945, the ICF supplied over 1.7 million food packets to soldiers and Asian prisoners of war, besides putting together warm clothes and other supplies.
- Thirty-one Victoria Crosses — 15 % of the total — went to soldiers from undivided India.
- Without Indian soldiers, non-combatant labourers, material and money, the course of both conflicts would have been very different as acknowledged by Field Marshal Auchinleck, Britain's last Commander-in-Chief of the Indian Army, in an interview years later.

Post-war scenario: Forgotten in India

- There is no recognition within India of its contribution to the world wars.
- In Britain, the contribution of the Commonwealth including the Indian subcontinent is memorialised in the Commonwealth Memorial Gates that lead up to Buckingham Palace.
 - The Gates commemorate the campaigns where Commonwealth soldiers served with distinction; there is also a canopy inscribed with the names of the Commonwealth recipients of the George and Victoria Crosses.
- Much of India's recent history is encapsulated in these gates, in a spirit of gratitude and equality.
- India did not recognise these contributions for many reasons, mainly due to the atrocities of colonial history.
 - When World War I ended in 1919 and Britain won with the help of Indian soldiers, India was denied its promised reward.

- o Britain betrayed the hopes of nationalists. Instead of self-government, the British imposed the Rowlatt Act, by silencing and censoring the press, detaining political activists without trial, and arresting without a warrant any individuals suspected of treason against the Empire culminating in the horror of Jallianwalla Bagh in April 1919.
- This was compounded when Viceroy Lord Linlithgow declared war on Germany on India's behalf in 1939 without consulting Indian leaders.

Recognising the heroes:








- The failure of Indian independence to follow automatically from India's participation in the wars does not mean that the war efforts extended colonial rule by protecting Britain.
- There was fighting on Indian soil to defend India. India was threatened in the Second World War by advancing Japanese forces who got as far as Burma/Myanmar. They were repulsed in the battles of Imphal and Kohima between March and July 1944. Know more about the Battle of Kohima in the link.
- Those who went abroad to fight alongside white British soldiers returned with the knowledge that they were equal to their colonial masters.
- Our today has been built on the sacrifice of many, including those who died fighting fascism. Therefore India's valuable contribution shall not be written out of its history books. It is our duty to recognise and honour them.

Nut Graf:



India's silence over world wars arises from the uneasy relationship between the Indian contribution to fighting fascism on a global stage and the nationalist movement for freedom at home. The success of the first is seen to have come at the cost of the second when Britain betrayed nationalist expectations of greater autonomy for India in return for support during World War I.

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-  **Video analysis of "The Hindu"**
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-  **Topic of the day**
A brief analysis of important topics for the exam
-  **This day in history**
A brief note on a major event that happened in the history of India and the world on this date
-  **AIR Spotlight**
-  **Sansad TV Perspective**

Weekly Updates

-  **Economy this week**
Round-up of business newspapers
-  **Gist of economic and political weekly magazine**
-  **International Relations This Week**
-  **GK and current affairs quiz**

Monthly Updates

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Compilation of current affairs
-  **Gist of magazines**
Extracts of articles and points from "YOJANA" and "KURUKSHETRA"

SOCIAL JUSTICE

1. EWS quota judgment

Syllabus: Mechanisms and Laws for Protection & Betterment of These Vulnerable Sections

Mains: Analysis of Reservation in India

Context: On September 27, 2022, a Constitution Bench led by Chief Justice of India U. U. Lalit heard multiple petitions against reservations based solely on economic criteria introduced by the Constitution (103rd) Amendment Act, 2019.

Introduction:

- After extensive hearings, a five-judge Constitution bench reserved its verdict on a batch of pleas challenging the validity of the 103rd Constitution amendment providing 10 per cent reservation to economically weaker sections (EWS) persons in admissions and government jobs.
- The legal question is whether the EWS quota violated the basic structure of the Constitution.
- Earlier, the Union government in 2019, had also told the Supreme court that the amendment, granting a 10% quota for EWSs, was brought in to promote “social equality” by providing “equal opportunities in higher education and employment to those who have been excluded by virtue of their economic status”.

103rd Constitutional Amendment Act

- The 103 Constitutional Amendment Act brought in a 10% reservation for Economically Weaker Sections (EWS) of society other than Backward Classes, Scheduled Castes, and Scheduled Tribes for admission to central government and private educational institutions and recruitment in central government jobs.
 - The Amendment Act modified Article 15 to allow the government to provide for the progress of economically weaker sections.
- The amendment involved introducing Article 15(6) and corresponding clause 6 in Article 16 to enable state to provide reservations for “any economically weaker sections of citizens” other than those “socially and educationally backward classes” and Scheduled Castes and Scheduled Tribes.
- The Constitutional Amendment Act also covers private unaided educational institutions, except minority educational institutions.
 - It amended Article 16 to facilitate the reservation of economically weaker sections for up to 10% of all posts.
- The amendment leaves the definition of ‘economically weaker sections’ to be determined by the state on the basis of ‘family income’ and other economic indicators.

Issues raised against the 103rd Constitutional Amendment Act:

- The legal challenge to the validity of the 103rd amendment is a ‘basic structure challenge’.
 - As the Amendment violates the principle of equality
 - The Amendment breaches the 50% ceiling on reservations, and
 - The Supreme Court has consistently ruled that for reservations to be reasonable and not to defeat the main right to equality, the total reservations should not be greater than 50 per cent. However, this ‘50 per cent ceiling’ stands effectively breached by the 103rd Constitution amendment.
 - One of the reasons for the quota limit of 50% is explained in Indra Sawhney where the Constitution was seen as enabling “appropriate representation” and not “proportionate representation”.
- Under Article 16(4), reservations for backward classes (SC/STs, OBCs) are dependent on beneficiary groups not being ‘adequately represented’ but that has been omitted in the newly inserted Article 16(6) for EWS.
- The amendment through Article 16(6) ends up making it easier for the state to provide reservations in public employment for EWS than the requirements to provide reservations for ‘backward classes’ under Article 16(4).

Challenge in SC:

- The argument is that with the 103 Constitutional Amendment Act coming into force, the total reservation quota would go up to 59.5%, which is against the Supreme Court ruling in the Indra Sawhney judgement of 1992.
- The amendment violated the basic structure of the constitution since it violated the Right to equality by excluding OBC/SC/ST candidates from the EWS category, making reservations on economic criteria and breaching the 50% ceiling on total reservations.
- The income criteria are arbitrary and have been fixed without obtaining or considering any report.

Government's Argument:

- The Ministry of Social Justice and Empowerment argued that under Article 46 of the Constitution, part of Directive Principles of State Policy that is non-justiceable, the state can take such measures as it has a duty to protect the interests of economically weaker sections: "The state shall promote with special care the educational and economic interests of the weaker sections of the people, and, in particular, of the Scheduled Castes and the Scheduled Tribes, and shall protect them from social injustice and all forms of exploitation."

SC Ruling:

- A Constitution Bench of the Supreme Court in a 3:2 majority decision has upheld the validity of the 103rd Constitutional Amendment, which provides 10% reservation for the Economically Weaker Sections (EWS) in government jobs and educational institutions.
- On questions of whether such reservations on the sole basis of economic criterion violated the Basic Structure of the Constitution, the three judges in the majority said that reservation on economic criterion alone does not violate the Basic Structure of the Constitution.
- The exclusion of the "poorest of poor" among SC, ST, OBC and Socially and Educationally Backward Classes (SEBC) from the scope of EWS has been controversial to which one of the judges replied that the 103rd Amendment just created a separate class of EWS without affecting the special right of reservation provided to, STs, SCs, OBCs, and SEBCs.
- Further, the majority opinion dismissed the argument that the 10% EWS quota would breach the ceiling limit of 50% on reservations as the 50% rule formed in the Indra Sawhney judgment was "not inflexible" and it also applied only to SC/ST/SEBC/OBC communities and not the general category.
 - To this argument, a judge who gave the minority view responded by saying that allowing the breach of the 50% ceiling limit would lead to further infractions and result in compartmentalisation.
- The two dissenting judges Chief Justice U.U. Lalit and Justice Ravindra Bhat also agreed that introducing economic criteria did not violate the basic structure of the constitution but they were against the exclusion of backward classes from the EWS category which violated the basic structure of the constitution.
- Justice S Ravindra Bhat struck down Articles 15(6) and 16(6) for being discriminatory and violative of the equality code and Chief Justice U.U.Lalit concurred.

Constitutional examination of reservations in India:

- The **State of Madras v. Smt. Champakam Dorairajan (1951) case** was the first major verdict of the Supreme Court on the issue of Reservation. The case led to the first amendment to the Constitution.
 - The Supreme Court in the case pointed out that while in the case of employment under the State, Article 16(4) provides for reservations in favour of the backward class of citizens, no such provision was made in Article 15.
 - Pursuant to the Supreme Court's order in the case, the Parliament amended Article 15 by inserting Clause (4).
- In the **Indra Sawhney Case of 1992**, the Supreme Court while upholding the 27 percent quota for backward classes, struck down the government notification reserving 10% government jobs based purely on economic criteria and called it unconstitutional.
 - The Supreme Court in the same case also upheld the principle that the combined reservation beneficiaries should not exceed 50 percent of India's population.
 - The Supreme Court's reasons included the position that income/property holdings cannot be the basis for exclusion from government jobs, and that the Constitution was primarily concerned with addressing social backwardness.
- The Parliament enacted the **77th Constitutional Amendment Act in 1995** which introduced Article 16(4A).
- The Supreme Court in **M. Nagaraj v. Union Of India, 2006 case** while upholding the constitutional validity of Art 16(4A) held that any such reservation policy in order to be constitutionally valid shall satisfy the following three constitutional requirements:
 - The SC and ST communities should be socially and educationally backward.
 - The SC and ST communities are not adequately represented in public employment.
 - Such a reservation policy shall not affect the overall efficiency of the administration.
- The Supreme Court in various cases had also ruled that economic status cannot be the sole criterion for reservation.
- In 2015, the Supreme Court rejected the notification issued by the Union Government to include Jats in the Central list of Other Backward Classes (OBC) for the benefit of reservation.
 - In its judgement, the court laid down new norms for the identification of backward classes for benefits of reservation and redefined the concept of affirmative action by the state.
 - The Court also held that caste, while acknowledged to be a prominent cause of injustice in the country historically, could not be the sole determinant of backwardness. New practices, methods and yardsticks have to be continuously evolved moving away from the caste-centric definition of backwardness.

Nut Graf: A five-judge constitution bench set down major legal issues including violation of Basic Structure to be debated for scrutinising the validity of the 103rd Constitutional amendment act which provided for quota benefits to the EWS in public employment and educational institutions.

2. Child marriage issue in India

Syllabus: Issues related to children.

Prelims: Recent trends about child marriage.

Mains: Child marriage- concerns and way forward

Context:

- UNFPA-UNICEF Global Programme to End Child Marriage team will visit India.

Background Details:

- The steering committee of The Global Programme to End Child Marriage will visit India to assess the status of Child marriage in India. It will particularly study the impact of the pandemic on the number of child brides.
- It should be noted that according to UNFPA-UNICEF, nearly 10 million children globally would have become child brides as a consequence of the COVID-19 pandemic.
- Recent Trends in India related to child marriages:
 - Child marriages reduced in India from 47.4% in the year 2005-06 to 26.8% in the year 2015-16. It registered a decrease of around 21% in a decade.
 - As per National Family Health Survey 5 (NFHS-5), it reduced by about 3.5% in five years and reached 23.3% in 2020-21.

Status of Child marriage across the world:

- As per UNICEF, approximately 12 million girls globally are married in childhood every year. And if accelerated efforts are not made, nearly 150 million more girls would be married before attaining the age of 18 by the year 2030.
- Though South Asia has made significant progress in the previous decade, where the share of child marriages reduced from around 50% to 30%, the progress is uneven across the region.
- According to health experts and rights activists, child marriage is not only against children's rights but also causes more maternal and infant deaths. Moreover, children born to adolescent mothers are more prone to stunted growth, as they have low weight at birth. NFHS states that child stunting stood at 35.5% in 2019-21.
- The efforts to reduce child marriage should be significantly accelerated to achieve the target set under Sustainable Development Goal (SDG) and end the practice by 2030.

India-specific findings:

- Even though India is witnessing a declining trend, 23.3% is still a high percentage in a country with a population of approximately 141.2 crores.
- 8 States in India have more child marriages in comparison to the national average. The states with the highest share of child marriages are West Bengal, Bihar, and Tripura. It is found that more than 40% of women in the age group of 20-24 years were married before the age of 18 years.
- Among the category of big States, Bihar and West Bengal have a very high prevalence of girl-child marriage. Child marriages are also very popular in tribal states with a large population. For instance, Jharkhand

has 32.2% of women (in the 20-24 age group) who became child brides. It should also be noted that the infant mortality rate is 37.9% and the prevalence of anemia in the women of age group 15 to 19 is 65.8% (as per NFHS-5).

- Similarly, Assam registered an increase in the incidents of child marriage from 30.8% in 2015-16 to 31.8% in 2019-20.
- States that have shown a decline in the share of child marriages are:
 - Madhya Pradesh: It reduced from 32.4% in 2015-16 to 23.1% in 2020-21.
 - Rajasthan: It also registered a decline from 35.4% to 25.4% during the same period.
 - Odisha: It declined from 21.3% in 2015-16 to 20.5%. It is just below the national average.
- States with better literacy rates, health outcomes, and social indices perform much better than other states. For example:
 - In Kerala, women who got married before the age of 18 stood just at 6.3% in the year 2019-20. The share was 7.6% in the year 2015-16.
 - Similarly, Tamil Nadu showed improvement from 16.3% in 2015-16 to 12.8% in the year 2019-20.
- It is evident from the data that child marriage is a key determinant of high fertility, poor maternal and child health, and lower social status of women.
- Data shows that girls with the education of primary level or below experienced higher levels of child marriages.

Policy interventions to deal with Child marriages in India:

- There are various laws to protect children from violation of human and other rights. Some of these laws are the Prohibition of Child Marriage Act, 2006, and the Protection of Children from Sexual Offences Act, 2012.
- Moreover, a parliamentary standing committee is deliberating on raising the marriageable age of women to 21. The union cabinet has already cleared the proposal.
- Marriages in India are governed by various personal laws and the government is looking forward to amend them. However, many experts argue that this will not be enough to end the practice of child marriage.
- There are also various centralized schemes like the Beti Bachao Beti Padhao that are working on improving the factors associated with child marriage. Moreover, several states have launched their own initiatives for the overall development of a child's future. For instance,
 - Kanyashree scheme of West Bengal provides financial assistance to girls wanting to pursue higher studies.
 - Bihar and other States provide cycles to the girl students.
 - U.P. has also launched a scheme to encourage girls to return to school.

Way Ahead:

- The solution to the issue of child marriage lies in girls empowerment apart from ensuring proper public infrastructure and addressing societal norms.
- Rights workers and welfare officials suggest that more efforts should be made on the factors that are closely associated with child marriages. Some of these measures are:
 - Poverty eradication
 - Better education and public infrastructure facilities for children
 - Increasing social awareness about inequalities, regressive social norms, health, and nutrition.
 - Strict laws with proper implementation.
 - Girl children should get adequate education and vocational training for financial independence.
- It should be ensured that Child Protection Committees and Child Marriage Prohibition officers are working efficiently and activating community support groups at the gram panchayat level. Such efforts can lead to building child marriage-free villages on the lines of Odisha. Odisha now have more than 12000 such villages.
- It should be noted that significant progress was registered in Karnataka, where the share of child marriages declined from 42% in 2005-06 to 21.3% in 2019-20. A series of interventions and recommendations from the Shivraj Patil Committee report (2011) was adopted by the government of Karnataka to reduce the prevalence of child marriage. Some of the measures adopted are:
 - Several thousand child marriage prohibition officers were notified.
 - Around 90,000 local gram panchayat members were roped in to spread awareness about the illegality of child marriage and its consequence on the maternal as well as child's health.

Nut Graf:

The issue of child marriage is highly prevalent across the globe. This has been further worsened due to the pandemic. India has made significant progress in this direction in the previous decades, but more efforts are required to achieve the target of ending the practice of child marriages by 2030.

EDUCATION

1. UDISE+ Report

Syllabus: Issues relating to development and management of Social Sector/Services relating to Education

Prelims: Unified District Information System for Education Plus (UDISE+) Report

Mains: Key findings of the UDISE+ report

Context:

- Release of a Unified District Information System for Education Plus (UDISE+) report by the Ministry of Education.

Unified District Information System for Education Plus (UDISE+) Report:

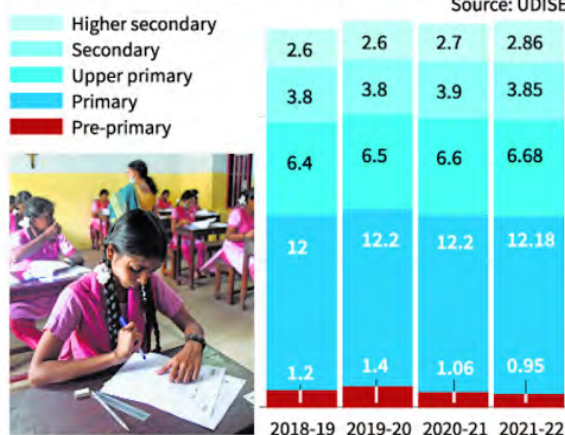
- Unified District Information System for Education (UDISE) was started in 2013 by integrating DISE for elementary and secondary education.
 - Ever since, it has been one of the largest Management Information Systems on School Education that covers over 1.49 million schools, over 9.5 million teachers and about 265 million children.
- UDISE+ report is an updated version of UDISE and now the entire system is made online and has been collecting data in real-time since 2018-19.
- UDISE+ report is released by the Ministry of Education.
- UDISE+ has been mandated to collect data from all schools imparting formal education from Classes I to XII.
- UDISE+ considers schools as the unit of data collection and districts as the unit of data distribution.
- UDISE+ collects data through an online Data Collection Form (DCF) based on parameters such as school, infrastructure, teachers, enrolments, examination results, etc.

Key findings of the latest UDISE+ report:

Class strength

The total number of students from primary to higher secondary increased to 25.57 crores in 2021-22. The chart shows enrolment (in crores) in different levels of education

Source: UDISE+



Source: The Hindu

- According to the report, the number of students entering pre-primary classes in 2021-2022 experienced a further reduction which has led to 30% fewer students in the school sections as compared to pre-Covid times.
 - As per the report, about 94.95 lakh students entered pre-primary classes in 2021-2022 which saw a drop of about 10% as compared to 2020-21 wherein close to 1.06 crore students entered pre-primary classes.
 - However, the year 2020-2021 also experienced a 21% drop in enrolment in pre-primary classes as compared to 1.35 crore student enrollments in 2019-2020 which was the year before school closures and classrooms moving online.
- The report also notes that younger students in areas where there is lesser access to remote learning continue to be the most impacted due to learning loss on account of the COVID pandemic.
- The enrollments into primary classes (classes 1 to 5) also witnessed a decline for the first time.
 - The enrollments reduced to 12.18 lakh in 2021-2022 from 12.20 lakh in 2020-2021.
- However, the report suggests that the total number of students from primary to higher secondary has increased by about 19 lakh to 25.57 crores.
- The report for the first time since the pandemic highlights that there was a reduction in the number of schools because of closures and a lack of teachers.
 - The number of schools in the country declined by about 20,000 in 2021-2022 (14.89 lakh) as compared to 15.09 lakh in 2020-21.
 - Additionally, the number of teachers also reduced from 96.96 lakh in 2020-2021 to 95.07 lakh in 2021-2022.
- Computer facilities were found in about 44.75% of schools and internet access was available in about 33.9% of schools.
 - However, the availability of computer facilities and internet access has improved as compared to pre-COVID years as only 38.5% of schools had computers and 22.3% had Internet facilities earlier.
- Further, the Gender Parity Index (GPI) which indicates the number of girls in school with respect to their population in the corresponding age group, was seen to be favourable to girls with a GPI value of 1.

Nut Graf:

The latest UDISE+ report suggests that the number of school dropouts is on the rise coupled with a decline in the number of schools and teachers post the COVID pandemic. This calls for significant efforts by the government and all the stakeholders as quality education is the right of every child in the country.

2. Autonomy and Higher Education

Syllabus: Issues Relating to Development & Management of Social Sector/Services-Education

Mains: Various Issues in Indian Higher Education System

Context:

The QS Asia University Rankings 2023 was released recently.

Introduction:

- The QS Asia Universities Ranking was released by Quacquarelli Symonds, a global higher education think-tank and compiler of the world's most-consulted university rankings portfolio.
- Around 19 Indian universities are featured in the top 200 list of 2023 rankings.
- Indian Institute of Technology Bombay has maintained its position as the country's top university by ranking 40th in the QS Asia Universities Ranking. It was followed by IIT Delhi which stood at 46th place. Then came the IISc Bangalore which stood at 52.
- The QS World University Rankings 2023 was released in June 2022.
- The QS World University Rankings are annually released and comprise an overall and subject-wise analysis of global institutes which is achieved by evaluating six metrics:
 1. Academic Reputation
 2. Employer Reputation
 3. Faculty/Student Ratio
 4. Citations per faculty
 5. International Faculty Ratio
 6. International Student Ratio
- Massachusetts Institute of Technology (MIT) is the top university in the world for the 11th consecutive year.
- The 2023 edition features 41 Indian universities, of which 12 improved their positions, 12 remained stable, 10 declined and seven are new entries.
- The top-100 list doesn't feature any Indian university for the sixth year straight.
- The IISc ranks 155th globally, and is the global leader in the citations per faculty (CpF) indicator, which QS uses to evaluate the impact of the research produced by universities.
- IISc Bengaluru, IIT Bombay and IIT Delhi are the only three Indian universities in the top 200.
- IIT Bombay saw a big dip from Rank 117 last year to Rank 172 this year.
- The report shows that India's presence in the top 500 category is also IIT-driven like other IITs around the world.

INDIA'S BEST

Top Indian institutes in QS World University Rankings 2023

2023	Institute	2022
155	IISc Bangalore	186
172	IIT Bombay	177
174	IIT Delhi	185
250	IIT Madras	255
264	IIT Kanpur	277
270	IIT Kharagpur	280
369	IIT Roorkee	400
384	IIT Guwahati	395

Source: Business Standard

Poor performance of Indian Institutes in world ranking:

- None of India's institutions of higher education appears in the list of the top 100 universities of the world.
- Only three of India's higher educational institutions are among the top 200 in the world. Another three are counted among the top 300 whereas two more are in the top 400.
- Overall, 41 Indian education institutes which made it to the rankings, have performed poorly across many key metrics.
 - For example, 30 out of 41 ranked universities have suffered declines in the Faculty Student Ratio (FSR) indicator, with only four recording improvements.
- No other Indian university, public or private, has found a place in the top 500 category globally, since the launch of the Institute of Eminence scheme.
- Only one Indian institution (IISc) is ranked among the top 400 worldwide institutions by Times Higher Education University rankings (THE). The Academic Ranking of World Universities follows a similar pattern (ARWU).

Autonomy in Top ranked institutions:

- Autonomy is regarded as a necessary and sufficient condition to attain excellence.
- The best universities in the world are flush with funds and they have a great degree of academic, administrative and financial autonomy.
- The top-ranked universities in the world are continuously sensitised about the importance of their autonomy and are trained and enabled to make their own decisions.
- The European University Association (EUA), for example, prescribes a 'university autonomy tool' that lets each member university compare its level of autonomy vis-à-vis the other European higher education systems across all member countries.

Autonomy in Indian Universities:

- India has a poor record with both the UGC and AICTE being seen more as controllers of education than facilitators.
- Funded through the UGC, universities are all subject to a very strict regulatory regime.
- The Indian Institutes of Technology (IITs) are better funded and also generally self-governed, enjoying a greater degree of autonomy as they fall outside the regulatory purview of agencies like UGC and AICTE.
- UGC regulations and AICTE guidelines encompass almost all aspects of higher education institutions functioning such as faculty recruitment, student admission and the award of degrees. In many cases, they are micro-managed by the regulatory authorities.
- Regulatory bodies with licensing powers hurt the autonomy of professional higher education, leading to a serious imbalance in the diarchy they were under, and partitioning general from professional higher education in several crucial areas of knowledge.

New Education Policy and Autonomy:

- A large number of commissions and committees, including the national policies on education and the National Education Policy 2020 have highlighted the need for higher education autonomy.
- The NEP recognises the importance of effective governance and leadership and that a common feature of all world-class institutions globally including India is the existence of strong self-governance and merit-based appointments of institutional leaders. It states that over a period of 15 years, all Higher Educational Institutions in India will become independent self-governing institutions.
- The NEP regards academic and administrative autonomy as essential for making higher education multidisciplinary, and that teacher and institutional autonomy is essential in promoting creativity and innovation.
- The policy considers a lack of autonomy as one of the major problems of higher education and promises to ensure faculty and institutional autonomy through a highly independent and empowered board of management which would be vested with academic and administrative autonomy.
 - The NEP also argues for a 'light but tight' regulatory framework and insists that the new regulatory regime would foster a culture of empowerment.
 - As per the NEP, a robust system of accreditation will gradually give full academic and administrative autonomy to all higher education institutions.
 - But the selective execution of the policy based on a convenient interpretation of the text is pushing higher education in the opposite direction.

Nut Graf:

The below-par performance of Indian universities in various rankings reflects the poor autonomy provided for higher education institutes in the country. Forcing higher educational institutions to follow standardised rules and regulations runs counter to what the NEP provides for. Micromanagement of these educational institutions takes higher education farther away from excellence.

GOVERNANCE

1. The amendments to the IT Rules, 2021

Syllabus: Government Policies and Interventions

Mains: Pros and Cons of Information Technology Rules, 2021.

Context:

- The Ministry of Electronics and IT (MeitY) has recently notified amendments to the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021 (IT Rules, 2021).

Introduction:

- In June 2022, the ministry published a draft of the amendments to the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021 and solicited feedback from the relevant stakeholders.
- The recent amendment notified the setting up of Grievance Appellate Committees (GAC) which will have control over content moderation decisions taken by social media platforms in India.
- The GACs will hear appeals from users challenging the decision of social media companies to remove or moderate content on their platforms.

What prompted the amendments?

- Governments across the globe are facing the issue of regulating social media intermediaries (SMIs).
- It is necessary for governments to update their regulatory framework to face new and emerging challenges given the multitudinous nature of the problem, the centrality of SMIs in shaping public discourse, the impact of their governance on the right to freedom of speech and expression, the magnitude of information they host and the constant technological innovations that impact their governance.
- In light of this, India replaced its previous outdated regulations on SMIs with the IT Rules, 2021 that were primarily aimed at placing obligations on SMIs to ensure an open, safe and trusted internet.
- New rules ensure that the interests and constitutional rights of netizens are not being contravened by SMIs.
- It also strengthens the grievance redressal framework with GACs.

Key changes effected by the amendment:

- Recent amendments impose a legal obligation on intermediaries to take reasonable efforts to prevent users from uploading harmful/unlawful content. The new provision will ensure that the intermediary's obligation is not a mere formality.
- For effective communication of the rules and regulations of the intermediary, it is important that the communication is done in regional Indian languages as well.
- The grounds in rule 3(1)(b)(ii) have been rationalised by removing the words 'defamatory' and 'libellous'. Whether any content is defamatory or libellous will be determined through judicial review.

- Some of the content categories in rule 3(1)(b) have been rephrased to deal particularly with misinformation, and content that could incite violence between different religious/caste groups.
- The amendment requires intermediaries to respect the rights guaranteed to users under the Constitution, including a reasonable expectation of due diligence, privacy and transparency.
- Grievance Appellate Committee(s) will be established to allow users to appeal against the inaction of, or decisions taken by intermediaries on user complaints. However, users will always have the right to approach courts for any remedy.
 - Prior to the IT Rules, 2021, platforms followed their own mechanisms and timelines for resolving user complaints.
 - Each Grievance Appellate Committee shall consist of a chairperson and two whole-time members appointed by the Central Government, of which one shall be a member ex-officio and two shall be independent members.
 - Any person aggrieved by a decision of the Grievance Officer may refer an appeal to the Grievance Appellate Committee within a period of thirty days from the date of receipt of communication from the Grievance Officer.
 - The Grievance Appellate Committee shall deal with such appeal expeditiously and shall make an endeavour to resolve the appeal finally within thirty calendar days from the date of receipt of the appeal.

Significance of this amendment:

- The latest amendment lays a definite due diligence obligation on social media firms so that no unlawful content or misinformation is posted on their platforms.
- Several digital platforms are accused of taking a "casual" and "tokenism" approach towards user complaints in the past one year.
 - The government had received lakhs of messages from citizens regarding the action/inaction on the part of the intermediaries on grievances regarding objectionable content or suspension of user accounts.
- The amendments will ensure that these digital platforms respect the fundamental rights accorded to citizens under Articles 14, 19 and 21 of the Constitution.
- This is in line with the government's focus to make the Internet a safe, trusted and accountable space for users.

Criticism against recent amendments:

- Grievance Appellate Committees are appointed by the union government which would give the government power to moderate content on social media.
 - This would make the government the arbiter of permissible speech on the internet and incentivise social media platforms to suppress any speech that is against the government.

- o Non-government organisation Internet Freedom Foundation have shared their concern that the government-appointed committees could apply “opaque and arbitrary methods” while hearing the appeals.
- If users can approach both the courts and the GAC parallelly, it could lead to conflicting decisions often undermining the impartiality and merit of one institution or the other.
- The amendment put forth the obligation that all social media intermediaries resolve all complaints within 72 hours of reporting.
 - o The shortened timelines might lead to hastier decision-making with respect to censoring the content without proper scrutiny.
- Several media outlets have challenged the new IT rules in courts. They have argued that the guidelines will allow the government to directly control their content.
 - o In May 2022, the Supreme Court had put a stay on the proceedings pending before various High Courts on petitions against the new Information Technology Rules.
 - o In August 2022, a division bench of the Bombay High Court had stayed the implementation of Rule 9 (1) and (3) of the new IT rules. The provisions deal with the code of ethics under the new IT rules.
- In a country where there is still no data privacy law to protect citizens from excesses committed by any party, encouraging digital platforms to exchange more information could backfire.

Nut Graf: In a major push towards an Open, Safe & Trusted and Accountable Internet, the Ministry of Electronics and IT notified amendments to IT rules 2021, aimed at protecting the rights of Digital Nagriks. They have been notified against the backdrop of complaints regarding the action/inaction on the part of the intermediaries on user grievances.

2. Broadcast of socially relevant topics

Syllabus: Government policies and interventions for development of various sectors and issues arising out of them.

Mains: Significant role played by the media in a Democracy

Context:

- The Union Cabinet recently approved new guidelines for public service broadcasting.

Introduction:

- Under new guidelines, all stations having permission must have to broadcast content on issues of national importance and social relevance for at least 30 minutes every day.
 - o The guidelines exempt foreign channels and sports channels as it is not feasible to broadcast such content.
- Acknowledging that airwaves or frequencies are considered public properties and are to be used in the best interest of society, the guidelines have listed eight themes as national importance and social relevance.
- The half-an-hour content will not be provided by the government. The TV channels are given the freedom to create and broadcast their own content.

- These guidelines will replace the existing ones operational since 2011 and would ease the issue of permission to the companies and limited liability partnership (LLP) firms registered in India for uplinking-downlinking of TV channels and associated activities.

Significance of public service broadcast:

- Public service broadcast assumes importance in the time of polarising opinions, heated debates and narrow targeting of ideas on television.
 - o Public service broadcasting will allow different viewpoints to be expressed and foster an enlightened understanding of current events.
 - o A free exchange of ideas, free exchange of information and knowledge, debating and expression of different viewpoints are important for the smooth functioning of democracy.
- The themes of national importance and socially relevant issues that have been picked out include education and spread of literacy, agriculture and rural development, health and family welfare, science and technology, welfare of women and weaker sections of society, protection of environment and of cultural heritage and national integration.
 - o These are subjects on which a lot more awareness is necessary.
- According to a FICCI-EY report, with television subscriptions estimated to add another 42 million by 2025 from 178 million in 2021, on the face of it, the public service broadcast is crucial in a diverse country with innumerable issues.
- It also makes a major contribution to shaping a sense of national identity.

Issues with the guidelines:

- Once the guidelines are implemented, the Ministry of Information and Broadcasting will monitor the channels for the broadcast of this content. In case non-compliance is observed in the Ministry's view, an explanation will be sought.
 - o If a channel continues to be non-compliant, more steps can be taken based on specific advisories that will be issued from time to time, and on a case-to-case basis.
- The guidelines say “the Central Government may, from time to time, issue a general advisory to the channels for telecast of content in national interest, and the channel shall comply with the same”.
- Though the Government has left it to the channels to “appropriately modulate their content to fulfil the obligation”, its stated intention to step in as and when required may be seen as an attempt to control mainstream media to its advantage.
 - o The government's pressure in the name of regulations is dangerous for the freedom of media.
- Corporate and political power has overwhelmed large sections of the media, both print and visual, which lead to vested interests and destroy freedom.
- There is also no clarity yet on compensation norms and who is going to finance the public service component on TV.
- Representatives of several broadcasters pointed out that they had paid hefty fees for the use of airwaves and any binding guidelines that adversely impact their commercial interests is not fair.

Nut Graf:

New broadcast guidelines have made it obligatory for all TV channels to undertake public service broadcasting for a minimum period of 30 minutes a day on socially relevant topics. With wide consultations regarding the modalities, public service broadcasting can be used as an effective tool to “inform, educate, entertain” the public on relevant issues.

3. Draft digital data protection Bill

Syllabus: Government policies and interventions for development in various sectors and issues arising out of their design and implementation

Prelims: About the Digital Personal Data Protection Bill, 2022

Mains: Important provisions and Significance of Digital Personal Data Protection Bill, 2022

Context:

The shortened and revised version of the draft Bill on digital personal data protection has been tabled by the government for public and stakeholder comments.

Digital Personal Data Protection Bill, 2022**Bill's ambit**

The draft Bill narrows the scope of the data protection regime to personal data protection – a move welcomed by the industry

**THIS ACT APPLIES TO:**

- Personal data collected from users online
- Data collected offline, but later digitised

THE ACT EXCLUDES:

- Personal data processed by an individual for personal or domestic purpose
- Recorded personal data in existence for at least 100 years

Source: The Hindu

- The key objective of the draft Bill as mentioned is to provide for the processing of digital personal data in a manner that recognises the right of individuals to protect their personal data as well as the need to process personal data for lawful purposes.
- The Bill also aims to create a relationship of trust between the **Data Principal** (the person to whom personal data belongs) and the **Data Fiduciary** (the entity deciding the means and purpose of processing personal data).
- Further, the Bill also provides for establishing the **Data Protection Board of India** and lays down detailed functions of the Board.
- Acknowledging the industry concerns against the Personal Data Protection Bill, 2019, the government in the new draft Bill has narrowed the scope of the data protection regime to only personal data protection and has left out non-personal data from its purview.
- The latest draft Bill proposes to impose a hefty fine of ₹10,000 on individuals providing false information while applying for any document, service, etc. or registering a false or false complaint with a Data Fiduciary or the Board.

- The new draft Bill has also conceded significant concessions on cross-border data flows and proposes that the Union government will notify countries or territories outside India along with terms and conditions to which a Data Fiduciary may transfer personal data.
- The Bill also accords the government the power to grant exemption from the provisions of the Bill in the interest of the **sovereignty and integrity of India** and in order to maintain **public order**.
- The **draft Bill on the Consent of Individuals:** the Bill mandates that the consent of the individual must be made the basis for the processing of their personal data, except in such cases where seeking the consent of the Data Principal is impracticable or inadvisable.
 - All such requests made for consent must be presented to the Data Principal in a clear and plain language and an option must also be provided to access these requests in English or any other language listed under the Eighth Schedule to the Constitution.
 - The government has further introduced the concept of “Consent Managers” through the draft Bill wherein the consent manager platform will help individuals view and monitor their interactions with Data Fiduciaries and the consent given to them.
- **The use of “she” or “her” to refer to all individuals:** For the first time in India, the draft Digital Personal Data Protection Bill, 2022, has used the pronouns “she” and “her” to refer to individuals of all genders as against generally used “he”, “him” and “his”.

Draft Digital Personal Data Protection Bill Concerns

- **Missing data protection rights**
 - The DPDP Bill, 2022 has missed out to provide the right to data portability
 - The right to data portability ensured that the data principals would get all the information about all the personal data they had provided to the data fiduciaries and data that the fiduciaries had developed based on the data provided in a structured format.
 - The right to be forgotten also does not find its place in the DPDP Bill, 2022
 - By exercising the right to be forgotten the data principals could have asked the data fiduciaries to restrain themselves from continuous disclosure of their personal data.
 - The right to be forgotten is in line with the right to freedom of speech and expression and the right to information for all other individuals.
- **Processing of the personal data of children**
 - Another key issue with respect to the DPDP Bill, 2022 is that the “age of digital consent” continues to be 18. The age of digital consent refers to the age at which an individual can consent to the processing of their personal data.
 - This provision indicates that parental or guardian consent would be mandatory in order to process the personal data of individuals below the age of 18 years.
 - Experts believe that the high threshold of 18 years undermines the evolving capacity as it fails to recognise the difference between the consent of a toddler and that of a teenager.

- o Requiring the consent of parents or guardians can affect the autonomous development of children and such restrictions are against India's obligations under the Convention on the Rights of the Child.

- **Provisions of data localisation**

- o The Personal Data Protection Bill, 2019 provided for a three-tiered categorisation based on which personal data could be moved across borders. This provision was met with severe opposition from the industry as it would result in an increase in compliance and operational costs due to higher data storage charges and security risks.
- o As a result the DPDP Bill, 2022 tried to address these concerns by permitting cross-border data flow to only those countries and territories notified by the Union Government.
- o However, the draft Bill does not provide any guidance or criteria for the consideration while notifying countries and thus accords discretionary powers to the Union Government.

- **Greater powers to the Union Government**

- o The government is one of the largest data fiduciaries in the country as it processes the personal data of crores of citizens on a daily basis in order to provide various services and benefits. Therefore, providing extended powers to the Union government leads to a conflict of interest and the concerns of excessive delegation of legislation.

- **Weakened Data Protection Board of India (DPB)**

- o The latest draft Bill has reduced the scope of the proposed Data Protection Board of India (DPB) and has accorded greater powers to the Union Government.
- o The Union Government will exercise greater control over the DPB as it is mandated with the appointment of members, framing the terms and conditions of appointment and mentioning the functions of the DPB.

- **Exemptions to the state's processing of personal data**

- o The central government is provided with the power to mention fair and reasonable purposes for which the state can process personal data without consent.
- o Also, an exemption is provided if the processing is conducted "in the interests of prevention, detection, investigation of any offence or any other contravention of any law". The central government can also extend exemptions to certain data fiduciaries based on the "volume and nature of personal data" processed without taking into account the purpose of processing data.
- o Furthermore, a complete exemption can be provided if the personal data is being processed "in the interests of sovereignty and integrity of India, security of the State, friendly relations with foreign States, maintenance of public order or preventing incitement to any cognizable offence relating to any of these".
- o Experts point out that these provisions violate the test of "necessity and proportionality" mentioned by the Supreme Court in its K.S. Puttaswamy Judgement.

Nut graf: After the withdrawal of the Personal Data Protection Bill from Parliament, the government has released the revised draft Bill for consultation called the Digital Personal Data Protection Bill. However, digital rights activists have raised concerns, highlighted multiple loopholes in the draft Bill and urged the government to address these issues in order to ensure an efficient data protection regime in the country.

DISASTER MANAGEMENT

1. CSIR-NGRI to install early warning system against floods, rockslides, and avalanches in Himalayan States

- The National Geophysical Research Institute (NGRI) of the Council of Scientific and Industrial Research has initiated field studies to install an early-warning system in the Himalayan States against major and sudden floods, rockslides, landslips, glacier lake bursts and avalanches to prevent Chamoli kind of disasters in future.
- Scientists are working on systems which can detect less intense natural disasters as currently the systems are equipped to detect only major events through geophysical and seismological observations.
- The scientists have identified a few locations in the higher reaches of Uttarakhand for “densification” of seismometers and river gauges to take the total number to 100 from 60 and the objective is to monitor the river flows in specific areas along the catchment and detect a sudden rise in water levels that can cause hazards.
- Scientists have decided to take cognisance of the vibrations or “noise” recorded by the seismometers, which need not be due to earthquakes but can also be because of vehicular traffic, animal movement, rain, river flows and so on.
- These instruments can play a crucial role in ensuring the safety of large infrastructure projects and hydroelectric power plants in this region.
- The NGRI has also started using and adopting advanced technologies such as Machine Learning to help them in the detection of hazards in a faster manner.

2. Mangrove Alliance for Climate

- The Mangrove Alliance for Climate (MAC) was launched with India as a partner at COP 27 to meet global carbon sinking targets by restoring the mangrove ecosystem.
- It seeks to educate and spread awareness worldwide on the role of mangroves in curbing global warming and its potential as a solution for climate change.
- The alliance was launched by the **U.A.E. and Indonesia, and India, Australia, Japan, Spain and Sri Lanka have joined it as partners.**

Function:

- The MAC is an intergovernmental alliance with **voluntary commitments** and there is no mechanism to hold members accountable.
- The parties can decide their own commitments and deadlines to plant and restore the mangrove ecosystem.
- The members will also share expertise and support each other in researching, managing and protecting coastal areas.

India's Commitment:

- MAC aligns with **India's commitment to NDC** – to create an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent through additional forest and tree cover by 2030.
- India can contribute to the global knowledge base due to its extensive experience in mangrove restoration, studies on ecosystem valuation and carbon sequestration.
- Integration of mangroves into the **national REDD+**, Reducing Emissions from Deforestation and Forest Degradation programs are the need of the hour.
- Creating new **carbon sink from mangrove afforestation** and reducing emissions from mangrove deforestation are two feasible ways for countries to meet their NDC targets and achieve carbon neutrality.

Significance of Mangroves:

- The 2022 State of World's Mangroves Report, prepared by the Global Mangrove Alliance, finds that mangroves prevent more than \$65 billion in property damages and reduce flood risk to some 15 million people every year.
- Mangroves are one of the most carbon-rich forests of the tropics, storing carbon from the atmosphere at up to four times more than other forested ecosystems.
- Mangrove forests can survive extreme weather conditions and require low oxygen levels to survive.
- Mangrove forests — consisting of trees and shrub that live in intertidal water in coastal areas — host diverse marine life.
- Mangrove forests can store ten times more carbon per hectare than terrestrial forests and they can store carbon up to 400 per cent faster than land-based tropical rainforests.

India and Mangrove:

- India contributes to nearly half of the total mangrove cover in South Asia.
- As per the ISFR 2021, the mangrove cover in the country has increased by 17 sq. km. in year 2021 as compared to the mangrove cover assessed in year 2019.
- According to the Forest Survey report 2021 released in January, mangroves cover in the country is 4,992 square km, which is 0.15 per cent of the country's total geographical area. Since 2019, the cover has risen by only 17 sq km.
- West Bengal has the highest percentage of mangrove cover in India, mainly because it has Sundarbans, the largest mangrove forest in the world. It is followed by Gujarat and Andaman, and Nicobar islands.
- Maharashtra, Odisha, Andhra Pradesh, Tamil Nadu, Goa and Kerala also have Mangrove cover.

3. Methane Alert and Response System

- The Methane Alert and Response System (MARS), launched at the 27th United Nations Climate Change Conference, is a data-to-action platform set up as part of the UNEP to alert the government and businesses against the methane emissions.

Methane Emission:

- Methane (CH₄) is a hydrocarbon that is a primary component of natural gas. Methane is also a greenhouse gas (GHG), so its presence in the atmosphere affects the earth's temperature and climate system.
- Natural sources of methane include – emissions from wetlands and oceans, and from the digestive processes of termites. It is produced by the breakdown or decay of organic material.
- Human activities such as rice production, landfills, raising cattle and other ruminant animals, and energy generation are also sources of methane.
- Methane is also a powerful greenhouse gas. Over a 20-year period, it is 80 times more potent at warming than carbon dioxide.
- Methane has accounted for roughly 30 per cent of global warming since pre-industrial times.
- According to the **Intergovernmental Panel on Climate Change**, we must cut methane emissions at least 30% by 2030 – the goal of the Global Methane Pledge – to keep the 1.5°C temperature limit within reach.

Methane Alert and Response System:

- Developed in the framework of the Global Methane Pledge Energy Pathway – with initial funding from the European Commission, the US Government, Global Methane Hub, and the Bezos Earth Fund – MARS will allow UNEP to corroborate emissions reported by companies and characterize changes over time.
- MARS will be implemented with partners including the International Energy Agency, and the UNEP-hosted Climate and Clean Air Coalition.
- MARS will be the first publicly available global system capable of transparently connecting methane detection to notification processes.
- It will use state-of-the-art **satellite data** to identify major emission events, notify relevant stakeholders, and support and track mitigation progress.

GEOGRAPHY

1. Extreme Weather Events

Syllabus: Important Geophysical Phenomena

Mains: Role of Climate change on poor livelihoods in India

Context:

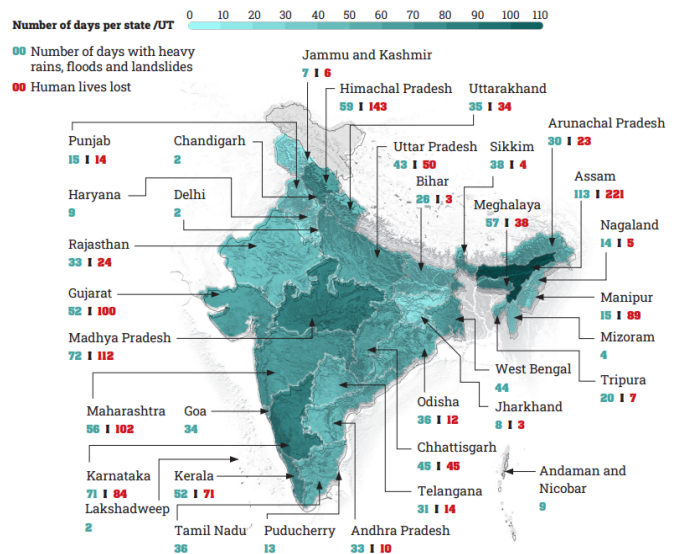
A recent report by the Centre for Science and Environment (CSE) and Down to Earth captured extreme weather events that occurred in India in 2022 so far.

Key Details:

- As per the report, India recorded extreme weather events on 242, or 88.6%, of the 273 days between January 1 and September 30 in 2022.
- This means that India has experienced a disaster “nearly every day in the first nine months of this year”, ranging from heat waves, cyclones, and lightning, to heavy rain, floods and landslides.
- Such events claimed the lives of 2,755 people, and affected 1.8 million hectares of crop area across the country.
- The country recorded its warmest March, and the third warmest April, in over a century. Madhya Pradesh witnessed the highest number of days with extreme weather events, with such events occurring every second day in the state.
 - Himachal Pradesh saw the highest number of human deaths, at 359.
- Region-wise, the central region (the states of Madhya Pradesh, Maharashtra, Gujarat, Chhattisgarh, Odisha and Goa) witnessed the highest number of days with extreme weather events at 198 and resulting in 887 deaths.
 - The east and northeast regions witnessed 783 deaths in all.
- Overall, extreme weather events affected 1.8 million hectares of crop area, destroyed over 4 lakh houses and killed almost 70,000 livestock.
 - More than 50% of Karnataka’s crop area has been affected over the year.

HEAVY RAINS, FLOODS AND LANDSLIDES

On 157 of 273 days, India experienced the extreme weather event. They claimed 1,214



IMD definition/criteria

Heavy rainfall happens when a region receives 64.5-115.5 mm rain in 24 hours. In the case of very heavy rainfall, the threshold increases to 115.6-204.4 mm and in extremely heavy rainfall it is 204.5 mm or more. The report has considered all very heavy and extremely heavy rainfall events, and heavy rainfall events only when they have caused damages.

Source: cseindia

Chart 2 | The chart shows the % of days in a month an extreme event was recorded in 2022. For instance, in January, 71% days saw a cold wave in at least one part of India

All figures in %	Heavy rains, floods and landslides	Lightning and storms	Cold waves/cold days	Heat-waves	Cloud-bursts	Snow-fall	Cyclones
Jan.	19	23	71	0	0	3	0
Feb.	0	18	29	0	0	4	0
Mar.	6	13	0	55	0	0	0
Apr.	20	63	0	77	0	0	0
May	68	65	0	35	3	0	3
June	100	77	0	47	0	0	0
July	100	100	0	3	13	0	0
Aug.	100	71	0	0	13	0	0
Sep.	100	93	0	0	7	0	0

Source: The Hindu

What are Extreme weather events?

- Extreme weather events are those that are “rare at a particular place and time of year”, according to the Intergovernmental Panel on Climate Change (IPCC).
- The India Meteorological Department (IMD) classifies lightning and thunderstorms, heavy to very heavy and extremely heavy rainfall, landslides and floods, cold waves, heatwaves, cyclones, snowfall, dust and sandstorms, squalls, hail storms and gales as extreme weather events.

Significance of the report:

- The report is timely and quantifies direct damages such as deaths and crop loss. However, it does not capture indirect impacts (such as impacts on human health and mental stress) caused by such extreme events because there is no mechanism to record them.
- Therefore, it demonstrates the need for “transparent and coherent methodologies” to quantify such losses and damages, “especially in data-poor and multi-hazard countries such as India”.
- This will also add to the discussions on loss and damage in the 27th Conference of Parties (COP27).

Nut Graf:

Recent report by the Centre for Science and Environment shows the increased severity of extreme weather events and the losses and damages they caused in India. This analysis acts as a timely intervention to pay attention to non-economic losses and damages, such as increased mental stress, loss of cultural practices, or escalating conflict due to climate variability.

2. Barren Island Volcano

Syllabus: Important geophysical phenomenon

Prelims: Volcanoes and Volcanic landforms

Context:

- INCOIS keeps watch on Barren Island volcano in Andaman & Nicobar Islands.

Key Details:

- The volcano on the Barren Island of the Andaman & Nicobar Islands is being closely watched to check for signs of an eruption which could lead to a tsunami or undersea landslide.
- The monitoring is being carried out by the Indian National Centre for Ocean Information Services (INCOIS), which houses the Indian Tsunami Early Warning Centre (ITEWC) in the Island.
- The volcano has been emitting smoke and is not capable of causing major destruction as per the scientists at INCOIS.
- INCOIS has seven tide gauges in the Indian Ocean and there are plans to put a seismic sensor and another tide gauge to catch any movement generated underwater.
- Recent tsunamis, including in Tonga, Tongan archipelago in the southern Pacific Ocean, have brought to the fore the challenge of tsunamis triggered by non-earthquake sources such as submarine landslides and volcanic eruptions which can wash away the regions near the source within a few minutes.
- INCOIS is aiming to address this lack of awareness and preparedness by local communities and officials leading to slow responsiveness.

Tsunami in Indian Ocean:

- Tsunamis can travel from 800 kmph in the deep ocean and about 30 kmph near the shore, with wave heights ranging from less than a metre to nine metres when they reach the shoreline.
- Scientists at INCOIS have calculated that it would take a magnitude of more than 6.5 on the Richter scale for a 'tsunamigenic' earthquake occurring in the Indian Ocean to hit the Indian coast, with travel time being 20 to 30 minutes to reach the A&N islands and two or three hours to hit the mainland.
- On India's west coast, off the Arabian Sea, Tsunami could emerge from the Makran region and take two or three hours to reach the Gujarat coast.

Indian Tsunami Early Warning System:

- The Indian Tsunami Early Warning Centre (ITEWC) established at Indian National Centre for Ocean Information Sciences, (INCOIS), Hyderabad, under Ministry of Earth Sciences is the national authority to issue tsunami advisories for India since 2007.
- It is an integrated effort of different organisations including the Department of Space (DOS), Department of Science and Technology (DST), the Council of Scientific and Industrial Research (CSIR), Survey of India (SOI) and National Institute of Ocean Technology (NIOT).
- The ITEWC functions as an approved Tsunami Service Provider of the Indian Ocean Tsunami Warning & Mitigation System (IOTWMS) that is an integral part of the Global Tsunami Warning and Mitigation System, established and coordinated by the Intergovernmental Oceanographic Commission (IOC) of UNESCO.
- The ITEWS system consists of a real-time network of seismic stations, tidal gauges, and a tsunami warning centre that operates around-the-clock to monitor tsunamis, detect earthquakes that could cause them, and alert vulnerable areas in a timely manner.
- ITEWC keeps vigil for unusual happenings on the sea to give advance warnings to 25 countries apart from India.
 - Whenever an earthquake of more than 6.5 on the Richter scale occurs within the Indian Ocean (or above 8 on the Richter scale in other regions), timely and accurate tsunami bulletins are generated.

3. Groundwater recharging

Syllabus: Water resources

Mains: Groundwater depletion and associated problems in India

Context: Ministry of Water Resources released a report on India's groundwater situation.

Details

- As per the assessment made by the Central Ground Water Board (CGWB), groundwater extraction in the country has seen an 18-year decline. Further, an overall decrease in the number of over-exploited units and a decrease in the stage of groundwater extraction level have also been reported.
- According to the 2022 assessment report, the total annual groundwater recharge for the country is 437.6 billion cubic metres (bcm) and annual groundwater extraction for the entire country is 239.16 bcm.
 - In 2020, annual groundwater recharge was 436 bcm and extraction 245 bcm and in 2017, recharge was 432 bcm and extraction 249 bcm.
 - The groundwater extraction in 2022 has been the lowest since 2004, when it was 231 bcm.
- Further, the report has categorised only 1,006 units as "over-exploited" out of 7,089 assessment units.
- The analysis reveals that the increase in groundwater recharge has been mainly due to the increase in recharge from canal seepage, return flow of irrigation water and recharges from water bodies/tanks and water conservation structures.

Water table:

- The water table is an underground boundary between the soil surface and the area where groundwater saturates spaces between sediments and cracks in rock. Water pressure and atmospheric pressure are equal at this boundary.
- The soil surface above the water table is called the unsaturated zone, where both oxygen and water fill the spaces between sediments.
 - The unsaturated zone is also called the zone of aeration due to the presence of oxygen in the soil.
- Underneath the water table is the saturated zone, where water fills all spaces between sediments. The saturated zone is bounded at the bottom by impenetrable rock.
- Such water, stored in subterranean spaces, is called groundwater and the water-bearing rock strata are called aquifers.

Groundwater Depletion:

- Groundwater is a critical resource for food security, accounting for 60% of irrigation supplies in India, the world's largest consumer of underground water. But unsustainable consumption of groundwater for irrigation and home use is leading to its depletion.
- It is also the principal water source for a fourth of the world's population.
- The agrarian economy of the Indo-Gangetic plains is sustained by groundwater.
 - Due to unregulated groundwater extraction, the Indo-Gangetic basin aquifer, especially in the States of Punjab, Haryana and Rajasthan may soon be incapable of supporting so much irrigation.
- According to the Central Ground Water Board (CGWB), with 230 billion metre cubes of groundwater drawn out each year for irrigating agriculture lands in India, many parts of the country are experiencing rapid depletion of groundwater.
 - The total estimated groundwater depletion in India is in the range of 122–199 billion metre cubes.

Reasons for Groundwater Depletion:

- Satellite gravimetry has provided convincing evidence in support of the alarming rates of groundwater depletion.
- The average rate of groundwater decline in Indo-Gangetic plains has been 1.4 cm per year in this century. Depletion is not so acute in regions where groundwater is brackish.
- Green Revolution enabled water intensive crops to be grown in drought prone/ water deficit regions, leading to over extraction of groundwater.
 - The Green Revolution has been sustained by using tube wells. The lowering of the water table forces farmers to use high-powered submersible pumps, which has worsened the situation.
- Inadequate regulation of groundwater encouraged the exhaustion of groundwater resources without any penalty.
- Natural causes such as uneven rainfall and climate change are also hindering the process of groundwater recharge. India is mainly dependent on the Indian summer monsoon rainfall and weaker summer monsoons can cause droughts. During such dry periods, water is extracted from the ground to meet

various needs leading to a reduction in groundwater levels.

- Deforestation is adding to the problem of groundwater depletion.

Impacts of Groundwater Depletion:

- Groundwater depletion lowers the water table leading to difficulty in extracting groundwater for usage. This will also increase the cost for water extraction.
- The basic cause of land subsidence is a loss of support below ground. When water is taken out of the soil, the soil collapses, compacts, and drops.
- Saltwater intrusion takes place. Under natural conditions the boundary between the freshwater and saltwater tends to be relatively stable, but pumping can cause saltwater to migrate inland and upward, resulting in saltwater contamination of the water supply.

Community-based movements to recharge groundwater:

- Aquifers are recharged with water from rainfall and rivers. Post-Independence, India saw an increase in the construction of canals for distributing water. These canals leak water, which also augments groundwater levels.
- In regions of Tamil Nadu and Karnataka, the aquifers are located in crystalline bedrock. In such rocks, water is found only in cracks and fissures as the rock itself is not porous.
 - Under these circumstances, tanks and ponds do not contribute much to groundwater recharge.
 - In rural areas of this region, recharge is mostly affected from rainfall and irrigation-related recycling.
 - The major source of groundwater recharge in an urban area (Bengaluru) is from leaks in water distribution pipes.
- Community-based movements to recharge groundwater is an important factor contributing to the good health of aquifers in some parts of our country.
 - For Example, thousands of small and large check dams built across seasonal rivers and streams in semi-arid regions of Saurashtra are acting as an important tool to recharge groundwater.
 - These dams slow the flow of water and contribute to groundwater recharge as well as to check soil erosion.
 - In villages, Bori bandhs are built, which are essentially sand-filled bags placed in the path of rainwater runoffs.
- Studies comparing the water table status in Saurashtra with the climatically similar regions of Marathwada and Vidarbha show a net positive impact.
- The regions of Maharashtra have also started their own Managed Aquifer Recharge programmes such as the Jalyukt Shivar.
- Atal Bhujal Yojana, co-funded by World Bank funding, was launched for sustainable management of ground water with community participation in the identified over-exploited and water stressed areas.

Way Ahead:

- It should be noted that there is no central law governing groundwater usage and different states have their own set of laws and regulations.
- It was recommended in the draft National Water Policy that there needs to be a shift from the cultivation of water-guzzling crops. The report also prioritised recycled water over freshwater for industrial usage.
- Water should not be considered a free and private resource and instead should be priced and utilized equitably.
- The climate crisis should be seen as an opportunity by the political class to build consensus and disincentivize its wasteful consumption.

Nut Graf: *Although the groundwater situation in India has marginally improved, India is suffering from the worst water crisis in its history. In this context, a shift in policy measures and community-based movements with the participation of every stakeholder play a key role in securing India's water future and ensuring that water consumption is not only environmentally sustainable or economically beneficial but is also socially and culturally just.*

4. Khangkhui

Context: Khangkhui caves of Manipur was in news on account of a study published by Zoological Survey of India (ZSI). As per the study the bats were killed and evicted from the Khangkhui cave after 2016-17 purportedly to make it "more tourist-friendly".



Figure: Khangkhui cave
Source: ukhrul.nic.in

Khangkhui cave:

- It is a natural limestone cave located in Ukhrul district of Manipur.

Historical importance:

These caves are of historical importance due to the following reasons:

- Excavations have revealed that it was **home to Stone Age communities.**
- During the advances of Japanese forces through Manipur and Nagaland in world war II, these caves were used as a shelter by the local people.
- Many artefacts which date back to the Palaeolithic culture have been discovered from this cave.

Ecological significance:

A large population of bats belonging to the Rhinolophidae and Hipposideridae families find shelter in these caves.

INDIAN SOCIETY & SOCIAL ISSUES

1. Elaben Bhatt

Syllabus: Role of Women and Women's Organization; Significant events and Personalities

Mains: Improving the condition of women to aid poverty alleviation in India

Context:

- Elaben Bhatt, a noted Gandhian, leading women's empowerment activist, and renowned founder of the Self-Employed Women's Association (SEWA) passed away at the age of 89.

About Elaben Bhatt:

- Elaben was born on September 7, 1933, in Ahmedabad.
- Her father, Sumant Bhatt, was a lawyer who served as a district judge and was later appointed the Charity Commissioner for Bombay and then Gujarat, where he supervised the work of all charitable organisations, trusts and NGOs.
- Her mother, Vanalila Vyas, served as secretary of the Gujarat branch of the All India Women's Conference for some time.
 - The organisation, founded by Kamaladevi Chattopadhyay in 1927, worked for educational and social reforms.
- After graduation, Elaben joined the Textile Labour Association (or Majoor Mahajan).
 - TLA, a trade union of mill workers was founded by Anasuya Sarabhai and its constitution was written by Gandhiji.
 - Here, Elaben Bhatt learnt the elements of organising, of the importance of a trade union — poor people and workers coming together to give each other strength to create a voice and to negotiate for rights.
- SEWA, the Self Employed Women's Association was set up by Ela Bhatt in 1972 as a branch of the Textile Labour Association (TLA), a labour union founded by Mahatma Gandhi in 1918.
 - It is a trade union based in Ahmedabad that promotes the rights of low-income, independently employed female workers.
- Elaben Bhatt also served as a Member of the Rajya Sabha and of the Planning Commission of India in the 1980s.
- She served in many international organisations, including Women's World Banking, a global network of microfinance organisations, of which she was co-founder and had served as Chairperson.
- She also served as an advisor to the World Bank and addressed the United Nations General Assembly.
- Elaben received numerous accolades and was conferred several national and international awards including Padma Bhushan, Magsaysay Award and the Indira Gandhi Sadbhavna Award.
- She was also a member of "The Elders", an international group started by Nelson Mandela.

Her work towards Women Empowerment:

- SEWA, pioneered by Elaben Bhatt, was one of the most innovative and successful experiments in India in the field of social development.
- With over 1.6 million participating women, SEWA is the largest organisation of informal workers in the world.
- With an annual membership fee of just Rs 10, SEWA allows anyone who is self-employed to become a member. Its network is spread across 18 Indian states, in other countries in South Asia, South Africa, and Latin America.
- It simultaneously provided employment to women and promoted cooperative production, consumption and marketing of textiles which constituted the core of India's industrialisation.
- It also decisively influenced the course of trade unionism and the labour movement in India.
- She did not believe that employment for women could be created and sustained by a simple banking device. According to her, any sustainable and rewarding employment must involve women's participation in the process of production, consumption and distribution. In the process, they should acquire education and skills, create institutions of their own and enhance their bargaining strength.
- As a Rajya Sabha member, she introduced bills for street vendors and home-based workers. Through her efforts, the Street Vendors Bill did become law.
- She produced the first All-India study called Shram Shakti in 1988.
- She propounded two significant theories, namely, the Hundred Mile Principle and the Grahini Theory of International Relations.
 - The Hundred Mile Principle involved the "use of products and services primary to life that are solely produced within a radius of hundred miles".
 - The Grahini Theory of International Relations combined such elements as the elimination of poverty and deprivation as an essential requirement for establishing peace, a society free of violence and the need to bring nature into the peace process.
- She has been called a gentle revolutionary. Both her ideas and her actions were revolutionary. She gave the world the path with which to reach out and change the lives of the poorest and she called it "Struggle and Development".
 - This path has been replicated all over India and even in many parts of the world.

Nut Graf:

Elaben Bhatt left an indelible mark on the course of the history of social development in India. With SEWA, she started a worldwide movement of women working at the base of the pyramid and changed millions of lives empowering not only poor working women, but also many educated and professional women who joined her movement and took it forward.

2. World Bank report on India's cities

Syllabus: Urbanization, their problems and their remedies

Mains: Sources of finances to meet the demands of urban areas, challenges associated with it and various solutions.

Context:

- As per the latest report of the World Bank named “**Financing India's Urban Infrastructure Needs: Constraints to Commercial Financing and Prospects for Policy Action**”, India would need to invest about \$840 billion in the next 15 years (an average of \$55 billion per year), to meet the demands of India's rapidly-growing urban population.

Sources of finances:

- Financing on a repayable basis can be convened through debt or private lending or public-private partnership investments.
- These finances need a recurrent source of revenue to meet the demands and obligations which require increasing adequate resources.
- A large share of urban infrastructure in India is financed by tied intergovernmental fiscal transfers. i.e. vertical and horizontal transfer of finance to achieve certain goals set sub-nationally.
- Out of the total finances required to fund capital expenditures for urban areas in India:
 - Nearly 48% is from State governments
 - Around 24% is from the Union government
 - About 15% is from urban local bodies' (ULB) own surplus.
 - The rest is from loans from Housing and Urban Development Corporation (HUDCO – 8%), public-private partnerships (PPP – 3%) and commercial debt (2%).
- According to the World Bank, only a few large cities have access to institutional banks and loans from them.
 - Further, the volume of commercial debt financing cannot be an accurate indicator because States can grant loans to their entities through their own regulated financial agencies at lower rates, terms and conditions.
 - Example: Tamil Nadu Urban Development Fund and Tamil Nadu Urban Finance and Infrastructure Development Company grant loans at concessional terms.

Challenges highlighted by the report:

- According to the report, the overall funding base required to increase commercial revenues is very low at present in the country due to the weak fiscal performance of cities and low absorptive capacity for the execution of projects.
- The World Bank has held that the low service charges collected for municipal services impair financial sustainability and viability as the urban bodies are not able to recover the operations and maintenance costs thereby affecting their ability to undertake and execute projects effectively.
- The latest report of the World Bank also notes that the urban bodies have failed to increase their resource and funding base to support private financing for

services like water supply, sewerage networks and bus services, as they are highly subsidised.

- These services are sourced from the urban body's general revenues, own-source revenues (revenue from house tax, professional tax, property tax, etc.), or fiscal transfers.
- Furthermore, the report with respect to private-public partnerships (PPPs) states that the existing revenue sharing model between the two entities has not been feasible for private investors and it also does not fully account for risk-sharing mechanisms for potential risks.

Key Recommendations:

- The major solution recommended by the report is to initiate efforts to expand cities' fiscal base and credit worthiness.
- As per the report, the fiscal base of cities can be improved if cities can institute a buoyant revenue base and are able to recover the cost of providing their services.
- The cost of providing the services can be recorded by revising the existing property taxes, user fees and service charges.

Nut graf:

- *As the urban population of the country is increasing at a rapid rate, unanticipated problems such as demand shocks and various legal and technical challenges with respect to the existing financial resources have surfaced. In this context, the latest World Bank report has highlighted urgent requirements to leverage greater private and commercial investments in order to meet the emerging financial gaps.*

3. India's population growth is stabilising, it is an indicator of effective health policies, says UN

Stabilising population

Fertility rates in 2019-21 across States/U.T.s in India

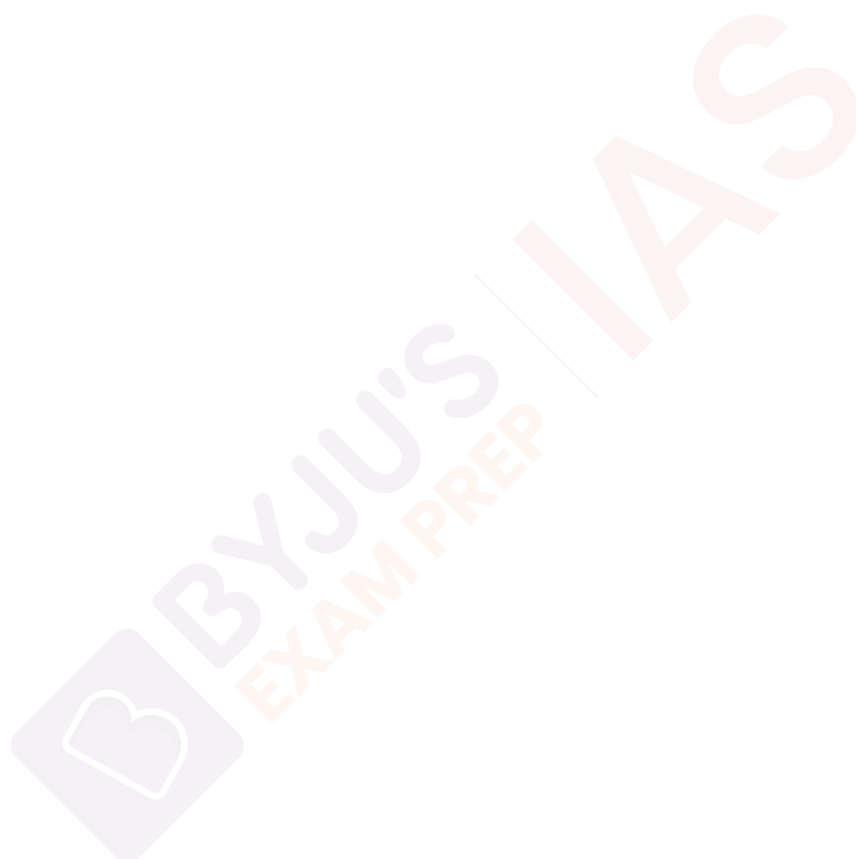


Fertility rates	States and U.T.s
>2.1	Bihar, Meghalaya, U.P., Jharkhand, Manipur
<=2.1 and >1.7	M.P., Rajasthan, Assam, Gujarat, Haryana, Mizoram, Uttarakhand, Arunachal, Chhattisgarh, D&N Haveli, Kerala, Odisha, Telangana, T.N.
<=1.7 and >1.4	Andhra, H.P., Karnataka, Maharashtra, Nagaland, Tripura, Delhi, Punjab, W.B., Puducherry
<=1.4	Chandigarh, J&K, Lakshadweep, A&N Islands, Goa, Ladakh, Sikkim

Source: The Hindu

- As the global population has breached the eight billion mark, the United Nations has said that India's population growth looks like it is stabilising which reflects the efficiencies of the country's policies, health systems, and access to family planning services.
- The world population touched eight billion recently and India was the largest contributor, having added over 177 million people of the last billion people born.
- However, India's population growth appears to be stabilising as the Total Fertility Rate (TFR) has reduced to 2.0 from 2.2 at the national level.

- o Further, about 31 States and Union Territories accounting for about 69.7% of the country's population have already achieved fertility rates below the replacement level of 2.1.
- One of the key reasons for the decline in fertility rate is the increase in the adoption of modern family planning methods (56.5% in 2019-21 as compared to 47.8% in 2015-16) and a decline in unmet need for family planning by four percentage points over the same period.
- The United Nations Population Fund (UNFPA) also notes that India is a youthful nation with the largest cohort of young people in the world and has the potential to achieve its demographic dividend.
 - o UNFPA further said that as many parts of the world are ageing, India's youthful population can be a global resource to resolve global problems.



MISCELLANEOUS

1. Donyi Polo Airport

- PM Narendra Modi recently inaugurated 'Donyi Polo Airport, Itanagar' in Arunachal Pradesh.
- The Donyi Polo Airport is the first Greenfield airport in Arunachal Pradesh. It will be the fourth operational airport for Arunachal Pradesh, taking the total airport count in the North-East region to 16.
- The Airport Authority of India has developed the Donyi Polo airport at an estimated cost of Rs 645 crore.
- It is equipped with a modern building that uses renewable energy, promotes energy efficiency and recycles resources used in the installation.
- The airport is located in Hollongi, 15 km from Itanagar, and is expected to connect the bordering region with other Indian cities apart from other parts of the state and the region.

2. Indira Gandhi Prize for Peace, Disarmament and Development

- Former Vice-President Hamid Ansari presented the Indira Gandhi Prize for Peace, Disarmament and Development of 2021 to Pratham, an NGO functioning in the field of education.
- The award is in recognition of Pratham's work in ensuring quality education for children of the country, particularly during the COVID19 pandemic.
- The Indira Gandhi Prize for Peace, Disarmament and Development was instituted in the memory of the former prime minister by the Indira Gandhi Memorial Trust in 1986.

3. Kalanamak rice



Figure: kalanamak rice
Source: Indiantimes

- Kalanamak is an **established traditional variety of paddy with a black husk and a strong fragrance**.
- It is **regarded as a 'gift from Lord Buddha' to the people of the Sravasti when he has visited the region after enlightenment**.
- It is **covered under 'One District One Product' (ODOP) scheme** as an ODOP product of Siddharthnagar (aspirational district in Terai belt of Uttar Pradesh).
- 11 districts of the Terai region of northeastern Uttar Pradesh and Nepal grow this rice.
- It is **secured under the Geographical Indication (GI) tag**.

Benefits of Kalanamak Rice:

- Farmer's **Benefits from Kalanamak Rice:** Kala Namak rice is grown majorly without using fertiliser or pesticide residues, making it perfect for crop production.
 - Because pesticides and fertilisers are not used, it saves a lot of money for farmers.
- Health **Benefits of Kalanamak Rice:**
 - Kala Namak rice acts as an antioxidant like anthocyanin, which assists in the prevention of cardiovascular disease and the advancement of skincare.
 - Kalanamak rice **includes a lot of micronutrients like zinc and iron**. Therefore, eating this rice is also said to protect against illness caused by zinc and iron deficits.
 - It is claimed that eating Kalanamak rice on a regular basis can help prevent Alzheimer's disease.
 - Kala Namak rice can also help strengthen, regrow, and galvanise the body, as well as help regulate blood pressure, diabetes, and skin damage.

Drawback of Kalanamak rice:

Kalanamak has relatively low yield due to the following reason:

- Grain formation makes the top part of the rice plant heavy. As a result the stem becomes weak which ultimately leads to the plant falling on ground.
- This phenomenon is called Lodging.
- This badly impacts the grain filling and quality of rice which ultimately leads to poor yield for this variety.

Cross breeding:

The objective behind cross breeding to prevent lodging was to bring dwarfness into the Kalanamak variety. At the same time the qualities of Kalanamak have to be retained.

- In the process dwarf genes from the rice variety Bindli Mutant 68, and also the gene of Pusa Basmati 1176 was used as a parent to cross with Kalanamak. As a result the progenies got dwarf characteristics.
- The progenies were further back-crossed with Kalanamak to restore its quality

4. Arunachal Pradesh New Airport

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- The Donyi Polo Airport is the first **Greenfield airport in Arunachal Pradesh**. It will be the fourth operational airport for Arunachal Pradesh, taking the total airport count in the North-East region to 16.
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- It is equipped with a modern building that uses renewable energy, promotes energy efficiency and recycles resources used in the installation.
- The airport is located in Hollongi, 15 km from Itanagar, and is expected to connect the bordering region with other Indian cities apart from other parts of the state and the region.

Significance:

- New Airport will give **boost to connectivity to north east** and will drive economic growth for the region.
- It will provide fillip to **logistics sector and tourism sector** in Arunachal Pradesh which is having rich Culture and Tradition.
- It will also help transform North East as major **gateway to South East Asia**.
- New airport will aid in providing **faster relief to affected areas** in case of natural calamities.
- The airport will act as a catalyst for the growth of trade and tourism in the region and also provide an opportunity for local produce like the **world-famous orchids** of Arunachal Pradesh to reach any part of India within hours.

YOJANA NOVEMBER 2022 - INDIAN MARITIME

1. Paradigm of Coastal Security

Introduction:

- India has a vast coastline stretched over 7000 kilometres having over 1000 offshore islands that bring enormous resources and opportunities.
- The long stretch of shores has been a habitat of varied coastal communities as well as vegetation. Safeguarding these waters from external threats and protecting India's maritime interests is of great importance.
- Around 95% of India's trade by volume and 68% by value is conducted through these waters, with priority being accorded to port-led development plans in recent years.
- The safety and unhindered continuity of maritime trade, through a wide network of ships is also a primary national concern as it directly impacts our economy.

Coastline Vulnerability:

- The coastal areas host major commercial cities, and significant strategic and vital installations of Defence, Atomic Energy, Petroleum, and private ventures besides 12 major ports and more than 239 non-major ports which increases the coastline's vulnerability.
- The geostrategic location of the Indian peninsula poses typical oceanic challenges owing to proximity to major international shipping lanes, hostile neighborhood-sponsored cross-border terrorism, transnational maritime crimes like narcotics and weapon trafficking, human trafficking etc., and dense fishing traffic around the Indian cape.
- Increased oceanic traffic may translate into an increased likelihood of maritime incidents and challenges in the proximity of the Indian coast.
- Use of sea route by terrorists during the attacks of 26/11 highlighted the vulnerabilities of India's coastline and its security.

Stakeholders in ocean governance:

- Several agencies including Indian Coast Guard, Indian Navy, Coastal Security Police, Customs, Fisheries, Port Authorities, Intelligence Agencies, and other Central and State Departments look after maritime security and governance.
- The multi-agency concept mandates cooperation, coordination, and institutionalised domain control of the respective agency to achieve foolproof security by optimum utilisation of limited resources.
- As per the concept of a tiered mechanism for surveillance in-depth, the Indian Coast Guard is additionally responsible for coastal security in territorial waters.
- Coastal Security Exercise namely 'Sagar Kavach' is conducted by the Indian Navy along with Indian Coast Guard and all stakeholders involved in Coastal Security.
- The exercise involves synergised application of maritime surveillance assets, coordinated air and maritime strikes, air defence, submarine and landing operations.

- Joint Coastal Patrol (JCP) by Indian Coast Guard and Coastal Police has been instituted across all coastal State and Union Territories.
- The apex level monitoring and review of the implementation of measures for enhancing the effectiveness of the Coastal Security Framework are done by the National Committee on Strengthening of Maritime and Coastal Security against threats from the sea.
- The Indian Coast Guard ships and aircraft provide the essential deterrence and ensure the security of maritime zones of India, thereby protecting the national maritime interests in such zones.

Conclusion:

The coastal security construct of the present day has successfully built synergy and coordination, which are very much required in the current security environment. The Indian Coast Guard has grown into a force to be reckoned with and is rightfully called "Sentinels of Sea," executing the roles of maritime law enforcement, ocean peacekeeping, and many other tasks.

2. International Maritime Transport

International Maritime Transport Status and Challenges:

- Trade barriers have diminished with globalisation, advancing marine engineering technologies and containerisation.
- Computerisation has changed the ways and conduct of international trade and transport.
- Recently a major disruption in the sector was caused by the Covid 19 Pandemic.
- Geopolitical factors of the Russia-Ukraine conflict and the China-Taiwan tensions also add up to the diminishing growth.
- Decarbonisation is another major challenge for maritime transport along with high Shipping costs, fuel costs, freight and logistics costs.
- **The main challenges in terms of quantity are:**
 - Geographical restrictions due to narrow channels
 - Capacity limits of ports for mega ships
 - Unused container spaces on ships (utilisation risk)
- **The main challenges in terms of sustainability are:**
 - Environmental regulations
 - Higher costs due to switch to sustainable fuels
 - Recycling of ships

Impact of Modern Technology:

- In shipbuilding, preference for light-weight components, superior hull coatings, energy efficient main and auxiliary machinery, condition monitoring, predictive maintenance regimes etc., will continue to improve.
- Electric cargo handling equipment, high stacker forklifts etc., are already present in many modern ports. E-documents, paperless smart technologies for swifter truck movement, digital tracking of containers etc., are changing the business process in Shipping.

Opportunities for Improvement:

- **Structure favourable tax regimes and incentivising shipping:** India is placed 35th amongst 46 countries in the PRIME (Protectionism in Maritime Economies) index, implying a high level of protectionism. Reduced protectionism can make shipbuilding and operations competitive and improve efficacy.
- **Low tonnage and dependence on foreign vessels for overseas trade:** This is largely attributed to the poor vessel turnaround and ageing Indian fleet (average age 20 years and above). This causes a bleed of foreign exchange also.
- **Lack of focussed attention on core and areas of concern:** These include ship building/repair/recycling; container manufacturing etc.
 - India has about 32 yards with the capacity to build ships but the major share of shipbuilding is held by the public sector yards.
- The global market in recycling is between USD 10-12 billion, whereas India's share is around USD 100 million only.
- **Development delays in Ports Sector:** The integration of inland waterways with ocean transport would pave the way for reducing congestion and costs.

Maritime India Vision 2030 (MTV 2030):

- The Maritime India Vision is a 10-year blueprint with the aim of overhauling the Indian maritime sector. The Maritime India Vision 2030 was launched by Prime Minister Narendra Modi at the Maritime India Summit in November 2020.
- Recently, a Direct Port Entry (DPE) facility of V O Chidambaranar Port Trust (VOCPT) has been inaugurated by the Union Minister of State for Shipping. This project will make Indian ports, world-class ports aligning with the 'Maritime Vision 2030' of the Ministry of Shipping. It will also help in increasing the Ease of Doing Business for the exporters as it is cost-effective.
- It is the latest venture of the Sagarmala programme which outlines a series of policy initiatives and development projects.
- Maritime India Vision 2030 will create the Waterways Connectivity Transport Grid, a project that will develop connectivity with Bangladesh, Nepal, Bhutan and Myanmar.
- Additionally, a Riverine Development Fund (RDF) will extend low-cost funding to finance inland vessels and for extending the coverage of the tonnage tax scheme to inland vessels.
- The Port Charges will be rationalised to make them more competitive along with scrapping of hidden charges levied by ship liners, thereby bringing in more transparency and accountability
- For decongestion of urban areas, and developing waterways as an alternative means of urban transport.

3. Coastal Erosion

What is coastal Erosion?

- Coastal Erosion is wearing away and redistributing solid elements of the shoreline as well as sediment, normally by such natural forces as waves, tidal and littoral currents, and deflation.
- Erosion occurs when the material being removed, for deposition elsewhere, exceeds the rate of supply finally resulting in the landward shifting of the shoreline.
- The causes of erosion are either natural or man-made. Sometimes, it is a combination of both.
- The coastal sediments, together with those arising from inland erosion and transported seaward by rivers, are redistributed along the coast, providing material for dunes, beaches, marshes, and reefs. The removal of the sand from the sand-sharing system results in permanent changes in beach shape and structure.

History of Coastal Erosion in India:

- Kerala is the worst affected state by coastal erosion in India.
- An assessment made in the late 1980s indicated that almost 85% of Kerala's coastline is vulnerable to erosion.
- Even Karnataka and Maharashtra are also affected badly by sea erosion.
- The problem in other states was found to be in patches/ coastal pockets depending on various factors. The first anti-sea erosion measure in Puducherry was initiated by the French in the early 1920s with a 1.75 km long retaining wall along the urban coastline in Puducherry.

Causes of Coastal Erosion:

- **Natural Causes:** Natural factors influencing coastal erosion are waves, winds, tides, near-shore currents, storms, sea level rise, etc. The combined action of different processes on the coastline like waves and tides maintains the stability of the shoreline.
 - Sea level rise is another major factor for coastal erosion.
 - Catastrophic events like severe storms, tidal surges and cyclones cause the sea level rise and cause severe erosion.
 - Coastal Erosion by Waves: Waves are the main cause of coastal erosion. Waves bring an enormous amount of energy to the coast that is dissipated through wave breaking, generation of currents, water level changes, and movement of sediment, turbulence, and heat.
- **Man-induced erosion:** Most of the human-induced erosion is due to human interventions in the natural transportation process as well as in the sediment load of the rivers. Human activity may be enumerated as Coastal defence structures, river regulation works, dredging aggregate extraction/ sand mining, oil/gas exploration and ports/harbours that impact sediment transport.
 - Coastal activities can also directly or indirectly result in beach erosion. For Example:
 - Construction of buildings via land reclamation has a long-term impact on coastal processes and sediment stability.

- Breakwaters, which obstruct the long-shore transport of sand and cause accretion on the up-drift side, and erosion downdrift
- The mining of sand/gravel.
- The removal of dune vegetation and mangroves
- Further, climate change has recently emerged as an important determinant in the coastal environment.
- The rising atmospheric concentrations of carbon dioxide are causing the oceans to absorb more of the gas and become more acidic. This rising acidity can have significant impacts on coastal and marine ecosystems.

Coastal protection measures:

- Coastal protection measures moderate the long-term average erosion rate of shoreline change from natural or man-made causes.
- Reduced erosion means a wider buffer zone between the land and the sea. Protection of the coastline from erosion is provided by nature in the form of a stable beach, capable of dissipating incident wave energy.
- Nature's coastal protection is also demonstrated at the headlands, reefs, shores, dunes, etc.
- Protection works to prevent erosion should be on a long-term basis and must be planned to suit the particular site conditions on the basis of thorough field investigation and available data which require observations over an extended period of time.
- The measures to control erosion include non-structural and structural or their combination.
- Many schemes have failed and resulted in environmental and socio-economic problems owing to improper design, construction and maintenance.

Non-structural measures:

- The Non-structural measures aim at the dissipation of the wave energy by mirroring the natural forces and maintaining the natural topography of the coast. These measures are also called soft solutions. Some of these are:
 - Artificial nourishment of beaches
 - Coastal vegetation such as mangrove and palm plantation
 - Sand bypassing at tidal inlets
 - Dune reconstruction/rehabilitation
- These measures have limitations. While artificial nourishment of beaches is complicated and costly, mangrove plantation is possible only in marshy land and in semi-tropical or tropical conditions.

Structural Measures:

- The structural measures, also known as the hard structural/engineering measures, use physical structures constructed near the coast to prevent or restrict water from reaching the potential damage areas.
- These solutions influence the coastal processes to stop/reduce the rate of coastal erosion.
- The structural measures used for coastal erosion prevention include seawalls, revetment, off-shore breakwaters, groins/groynes/spurs, offshore reefs, and artificial headland.

- Seawall is a popular measure and is generally used in almost all maritime States in varying proportions.

Shoreline Change Atlas of Indian Coast:

- Coastal Protection and Development Advisory Committee (CPDAC) recommended the need for preparation of a Coastal Atlas showing information related to coastal erosion derived from satellite data and protection measures undertaken by all maritime states of India.
- Accordingly, a project entitled, "Shoreline Change Atlas of the Indian Coast", was initiated by Space Applications Centre (ISRO), Ahmedabad, in collaboration with the Central Water Commission.
- SAC and CWC worked jointly to bring out a shoreline change atlas for the time frame 1989-91 and 2004-06 in 2014.
- The maps show eroding, stable and accreting coasts along with the status of coastal protection measures taken up by maritime States/UTs.
- Around 15% of the 7549 km coastline has eroded, 14% of the coast has accreted, and the remaining of the coast remained stable w.r.t 2004-06. The area under accretion is higher than the area under erosion with a net gain of 362 ha of land.
- The shoreline along the eastern Indian peninsula is observed to be more dynamic and along the west coast, the shoreline changes are more along the Kerala and Karnataka coast.

4. Marine Plastics Pollution

Marine Plastics Survey in India:

- Under the Coastal Ocean Monitoring and Prediction System (COMAPS) programme by ICMAM-PD now the National Centre for Ocean Research of the Ministry of Earth Sciences, accumulation of marine debris was reported along the coast of Great Nicobar Island, Andaman.
- This accumulation might have been due to surface ocean currents prevailing leading to the transportation of solid waste dumped by passing ships/fishing vessels.
- 8% of the total solid waste produced is plastic waste and the top three cities that contribute most to pollution are Delhi, Kolkata, and Ahmedabad.
- Plastic production in India increased by 39.7% and now stands at 9.46 million tonnes of plastic waste per year.
- Only 15% of the plastic waste produced is recycled in India and the rest is sent to landfills, incinerators, or dumped into the oceans and rivers. 0.6 million tonnes of plastic waste end up in oceans from India alone via rivers, surface run-off etc.
- Rivers contribute about 67% of the total marine plastic debris in the world.

Microplastics:

- Plastics are made from nonrenewable resources such as crude oil and hence they are hard to decompose as the polymers are bonded through covalent bonds, a strong bonding force.
- Microplastic is about 5 mm in diameter and is always disposed of into the environment through anthropogenic sources.

- They are particularly hard to locate, track and study as they are smaller than what the naked eye can see.
- Another major issue with microplastics is that they show a high affinity to other toxicants, making them more dangerous to the organisms ingesting them.
- The majority of the plastic debris (94%) in the oceans disintegrates into microplastic while the remaining 6% remains as microplastic.
- The Marine Plastics survey programme of NCCR studied the distribution of microplastics in Coastal locations in the Bay of Bengal (BoB) and Arabian Sea (AS).
 - This showed microplastics are observed in almost all the sampled sites in the Open Ocean in the 100m mid-water column in all seasons.
 - Compared to other transects, more microplastics were observed during pre-monsoon in BoB and post-monsoon in AS.
- The ocean is one of Earth's most valuable natural resources. Mankind exploits the ocean to meet his energy, food, recreational, military, and other needs. Oceans are used for transportation-both travel and shipping. Today around 80% of world trade is seaborne.
- The Indian Ocean is the third largest ocean, covering an area of more than 70 million sq km that includes extensive Exclusive Economic Zones (EEZ) of different countries and large "High Seas".
- The economic and sustainable development issues in the Indian Ocean rim is challenging since a majority of littorals are developing countries.
- These countries are home to one-third of the world's population that rely extensively on marine resources for livelihood and food security. The sheer size of this population subjects the Indian Ocean's resources to pressures from pollution, habitat degradation, and over-exploitation.

Abandoned, Lost or Discarded Fishing Gear (ALDFG):

- Abandoned, Lost, or Discarded Fishing Gear (ALDFG) is a serious problem worldwide.
- Most of these wastes are due to shipping or fishing accidents, bad weather, etc., and while most of the lost gear are retrieved by the fishers, the little that remains causes serious problems to the marine ecosystems.
- A lot of species are killed by these wastes, and since they do not decompose easily, they keep killing various organisms throughout their lifetime.
- About 20% of all the plastic debris in the oceans is from ALDFG according to UNEP. Globally, it is estimated that about 640000 tons of ghost gears are disposed of into the oceans every year.

Swachh Sagar, Surakshit Sagar:

- Commemorating the 75th year of India's independence, a coastal cleanup drive was carried out at 75 beaches across the country for 75 days over a 7500 km long coastline. T
- This unique first-ever national campaign culminated on "International Coastal Clean-up Day" on 17 September 2022.
- This drive was aimed to remove 1,500 tonnes of garbage from the sea coast which will be a huge relief to marine life and the people staying in coastal areas.

5. Blue Economy

Blue Economy

- According to the World Bank, the blue economy is defined as "sustainable development of ocean resources for economic growth, improved livelihoods and jobs while preserving the health of the ocean ecosystem."
- Ocean economy focuses on use of ocean resources and is aimed at empowering the economic system of the ocean. While the blue economy goes beyond viewing the ocean economy solely as a mechanism of economic growth
- Population explosion has led to immense pressure on land resources. The population growth and resultant consumption of natural resources have exceeded the regenerative capacities of natural systems.

Maritime Governance and Blue Economy:

- With its geographic and geostrategic position in and critical dependence on the Indian Ocean, India has been leading the Blue Economy discourse at the highest level of the Government, with a greater focus on the Indian Ocean region. The essence of this approach was spelled out by the Government for seeking "Security And Growth for All in the Region" (SAGAR).
- The Indian Ocean is vital to the economies, security, and livelihoods of its littoral states. India is focussing on overall maritime governance including economies based on marine resources assured, advancing the blue economy through sustainable management and utilisation of the ocean's resources, food security, and livelihoods for achieving Sustainable Development Goals (SDG).
- The current governance framework of marine resource management in the Indian Ocean explores the challenges in Blue Economy development to ensure sustainable development in the region. Maritime security is essential to ensure a holistic approach toward the governance, use, and maintenance of Oceans.

Significance of Blue Economy:

- Blue Economy would contribute to food security, poverty alleviation, the mitigation of and resilience to the impacts of climate change, enhanced trade and investment, enhanced maritime connectivity, enhanced diversification, job creation, and socio-economic growth.
- From the business perspective, Blue Economy requires innovative and dynamic business models, forming business connections between India and other countries.

Overview of India's Blue Economy:

- The Blue Economy of India includes the complete ocean resources system as well as human-made economic infrastructure in the country's legal jurisdiction, marine, maritime, and onshore coastal zones.
- It plays an important role in the country's economic growth because of its enormous maritime interests. It accounts for roughly 4% of the GDP.

- The sector has recorded exports worth US\$ 7.2 billion between April 2021- February 2022.
- Fisheries and minerals are the two most viable components of the blue economy in India. The two mineral deposits of commercial significance to developers in the Indian Ocean are polymetallic nodules and polymetallic huge sulphides.
- India comprises 200 ports of which 12 are major ports that handled 541.76 million tones in FY 2021, the highest being Mormugao Port, located in Goa, which handled 62.6% of the total traffic.
 - Shipbuilding and shipping are also important aspects of the blue economy in India. The modal share of coastal shipping has the potential to increase to 33% by 2035, up from roughly 6% presently.
- Most of the country's oil and gas are supplied by sea, leading to making the Indian Ocean region critical to India's economic growth.
- India has significant diplomatic interests in the Indo-Pacific, as well as international commitments in the region under the UNCLOS, such as Search and Rescue, seabed mining and antipiracy.

Maritime Security Strategy:

- India's maritime security strategy focuses on all aspects of the challenges including the ocean economy that are affecting the health and the future of oceans and countries.
- It combines the traditional and nontraditional security paradigms of maritime security such as environmental degradation, ocean trade security, drug trafficking and piracy among other traditional challenges.
- With nations committed to fulfilling the Sustainable Development Goals (SDGs) towards the Blue Economy, the role of oceans in this is significant.
- Maritime security is an enabler of the Blue Economy. The non-traditional security threats have effects on the military and also on strategy, policy and operations.
- Unregulated and illegal fishing is another aspect that endangers the ocean ecology.
 - Checks and Balances have been established to address illegal, unreported and unregulated fishing, still the current international law regime still lacks rigid barriers and strict mechanisms to address the problem.

6. Sailing through the history

Aircraft Carriers

- Aircraft carriers are extremely strong and have powerful weapons. Their military capabilities, which include carrier-borne aircraft, have completely changed the marine domain.
- An aircraft carrier offers a wide range of strategic benefits. It offers incredibly flexible operational options.
- Surveillance, air defence, airborne early warning, protection of Sea Lines of Communication (SLOG), and anti-submarine warfare are some of its principal functions
- For India, the carrier battle group, with its inherent combat elements and firepower, becomes a key capability to establish effective air dominance and efficient sea control.

History of Aircraft Carriers in India:

1. INS Vikrant (R11)- India's First Aircraft Carrier

- The INS Vikrant was launched on September 22, 1945 as Hercules. However, its construction was stalled and was completed when India purchased it from Britain in 1957.
- On March 04, 1961 it was commissioned as Vikrant in its first avatar. It was placed under the command of Captain Pritam Singh Mahindroo.
- On March 05, 1961, Vikrant sailed from Belfast for Portsmouth and Portland to carry out sea trials, and on October 06, 1961, Vikrant finally sailed for India. It entered Bombay on November 03, 1961.
- INS Vikrant was the first ever carrier for an Asian country and remained so for a long time. Soon after its commissioning, the INS Vikrant saw action during the Goa Liberation Operation in 1961.
- It played a crucial role in the 1971 war with its aircrafts decimating the enemy. The Sea Hawks and Alizes pounded the enemy targets over Chittagong, Cox's Bazar, Khulna and Mongla.

2. INS Viraat

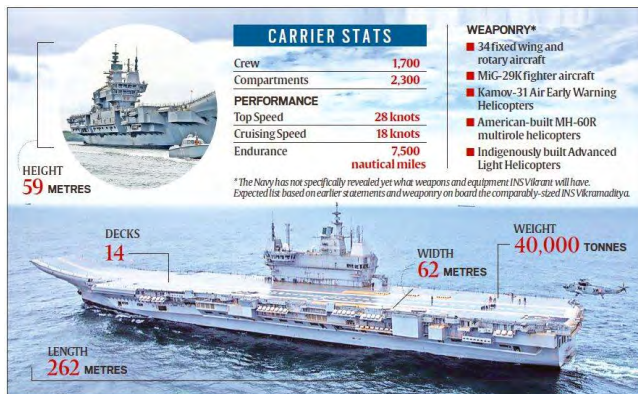
- INS Viraat was originally commissioned by the British Royal Navy as HMS Hermes on November 18, 1959.
- It served the Royal Navy in three different avatars- 1959-1970-as the Strike Carrier, 1970-1980- as a Commando Anti-Submarine Warfare Carrier, and 1980 onwards it was a V/STOL Carrier, for which it underwent major structural modifications.
- INS Viraat was finally commissioned by the Indian Navy on 12 May 1987.
- INS Viraat's first major operation was 'Operation Jupiter' in July 1989 as part of Peacekeeping Operations in Sri Lanka, following the breakdown of the Indo-Sri Lanka Accord of 1986.
- It also played a pivotal role in Operation Parakram, which was carried out in the wake of the 2001 terrorist attack on the Indian Parliament. By establishing a blockade against Pakistan during the 1999 Kargil War, the INS Viraat also played a crucial part in Operation Vijay.

3. INS Vikramaditya: Russia's refurbished Admiral Gorshkov was commissioned into the Indian Navy as INS Vikramaditya at Severodvinsk, Russia on November 16, 2013.

4. INS Vikrant (IAC-1):

- At 45,000 tonnes, INS Vikrant is the largest naval ship to be designed and built in India. It has an overall indigenous content of 76%.
- Vikrant has been built with a high degree of automation for machinery operation, ship navigation, and survivability, and has been designed to accommodate an assortment of fixed-wing and rotary aircraft.
- The ship is capable of operating an air wing consisting of 30 aircraft comprising MiG-29K fighter jets, Kamov-31, MH-60R multi-role helicopters, in addition to indigenously manufactured Advanced Light Helicopters (ALH) and Light Combat Aircraft (LCA) (Navy).

- Using a novel aircraft operation mode known as STOBAR (Short Take-Off but Arrested Landing), the IAC is equipped with a ski jump for launching aircraft, and a set of 'arrestor wires' for their recovery onboard.



Source: Indian Express

7. Port-led Development

Sagarmala Project:

- The prime objective of the Sagarmala Project is to promote port-led direct and indirect development and to provide infrastructure to transport goods to and from ports quickly, efficiently and cost-effectively.
- The Sagarmala Project aims to develop access to new development regions with intermodal solutions and promotion of the optimum modal split, enhanced connectivity with main economic centres and beyond through expansion of rail, inland water, coastal and road services.
- The Sagarmala initiative addresses challenges by focusing on three pillars of development, namely-
 - Supporting and enabling Port-led Development through appropriate policy and institutional interventions and providing for an institutional framework for ensuring inter-agency and ministries/departments/states collaboration for integrated development.
 - Port Infrastructure Enhancement, including modernisation and setting up of new ports.
- The Project intends to achieve the broad objectives of enhancing the capacity of major and non-major ports and modernising them to make them efficient, thereby enabling them to become drivers of port-led economic development, optimising the use of existing and future transport assets and developing new lines for transport, setting up of logistics hubs, and establishment of manufacturing centres to be served by ports in EXIM and domestic trade.
- It also aims at simplifying procedures used at ports for cargo movement and promotes usage of electronic channels for information exchange leading to quick, efficient, hassle-free cargo movement.

Skill Development under the Project:

- Under the programme, an integrated approach is being adopted for improvement in quality of life with a focus on skill building and training, upgrading of technology in traditional professions, focused, and time-bound action plan for improving physical and social infrastructure in collaboration with the coastal states.

- The main features of the Coastal Community Development plan include Skill development, Coastal tourism, Development of fishing harbours, and R&D in the Port and Maritime Sector.
- To ensure technology-based skill development, the Ministry of Shipping has set up the Centre of Excellence in Maritime & Shipbuilding (CEMS) with two campuses at Vizag and Mumbai that are operational from February 2019.
- Sagarmala has conducted skill gap studies for 21 coastal districts in India. Skill Development programmes in these 21 districts are being undertaken in convergence with Deen Dayal Upadhyaya Grameen Kaushalya Yojana programme.

8. Indian Coastal Community and Climate Change

Introduction:

- Most of India's coastal regions are low-lying and densely populated, with nearly 250 million people living within 50 km of the coast.
- The country has a total of 1382 offshore islands, comprising 514 Islands along the mainland coast and 868 Islands in the island territories (Andaman & Nicobar and Lakshadweep). Among the 1382 offshore islands, 346 islands are inhabited.
- As per the Census data of 2011, there are 486 census towns along the coast of India, accounting for a population of 41.7 million constituting 20.7% of the total coastal population.
- The coastal areas of India experience tropical climates and have diverse geological, geomorphologic, and ecological setups.
- India's coast is vulnerable to exponential developmental activities coupled with climate change impacts.
- The likely scenarios of climate change and associated variability pose the greatest risk to the socio-economic and environmental functioning of coastal regions.
- The coastal communities, for their livelihoods, face enormous challenges from natural calamities triggered by climate change parameters.
- Important coastal economic generation activities such as fishing, salt production, agriculture, aquaculture, animal husbandry have been affected by climate change.

Policies to address the impacts of Climate Change:

- The Coastal Zone Management Guidelines of India by MS Swaminathan emphasize strengthening the coping capacity of coastal communities to face the challenge of sea-level rise caused by climate change, as well as frequent Tsunamis and cyclones to protect life and livelihoods.
- The Ministry of Environment, Forests and Climate Change (MoEF&CC) has demarcated the Hazard Line which is a hundred years return interval of dangers by natural events such as cyclones, tsunamis, floods, storms, waves, and shoreline changes, and sea level rise due to global warming.
- The Coastal Regulation Zone Notification (2019) under Environment Protection Act (1986) directs to clear the developmental projects in the coastal areas after considering the disaster risks including climate change risks such as SLR and other natural disasters.

Sea Level Rise (SLR):

- Globally, the rate of sea-level rise is about 4.5 mm per year. It is projected that SLR risks 10% of the coastal population living in the low-lying coastal region within 10-m elevation of Mean Sea Level (MSL)
- SLR results in a combination of risks in retreat, submersion, erosion, and increased vulnerability to extreme marine events.
- It is one of the primary factors driving the historical shoreline changes and wave climate changes that engulf land masses with the economically potential physical infrastructures.
- Coastal communities and other stakeholders are impacted by loss of land, erosion, flooding, and saltwater intrusion in Coastal aquifers.

Increased sea surface temperatures:

- Sea surface temperature (SST) is the water temperature close to the ocean's surface.
- Increase in SST leads to alterations in climate patterns around the world. SST affects fish migrations, fish physiology, fish breeding, fish recruitment, and habitat loss. It also enhances ocean acidification, salinity, and longshore current patterns that influence primary production and fish stock in the sea.
- Change of SST not only affects fish stock and biomass but also influences cyclogenesis (development or strengthening of cyclonic circulation in the atmosphere), as the warm waters could transform tropical disturbances into cyclones. Tropical disturbances normally become cyclones if the SST is more than 26°C.

Shoreline Changes:

- The wave energy closer to the shore leads to an increase in shoreline changes in soft rocks and beaches.
- Based on the results of trend analysis, the coastal stretches of India have been classified as stable, accreting, low erosion, medium erosion, and high erosion coasts.
- Construction of seawalls, groynes, training walls, breakwaters, and other protection structures on the shores to reduce the impacts of SLR, wave action, and erosion are classified as artificial coasts (AC).
- Shoreline changes cause social and economical effects on livelihoods, property, recreation and tourism, ecosystem services, resilience, and vulnerability.

Frequency of cyclones and floods:

- The coastline has undergone physical changes throughout its geological past due to continuous wave actions, floods, cyclones, earthquakes, and tsunamis. Besides cyclones, tidal range, storm period, high tide water level, shoaling waves, river discharge, and rainfall-driven runoff also contribute to flooding in coastal areas.
- During the 21st century, there has been an increase in the occurrence and severity of flood hazards in India.
- Cyclones and floods cause casualties, and injuries besides the devastation of coastal infrastructures, road networks, schools, cyclone centres, health centres, houses, and, other common properties which are livelihood capitals and assets of coastal communities.

Saltwater Intrusion:

- The primary data of the coastal villages in coastal districts indicate that there are saltwater intrusions in near-shore freshwater sources during the summer season as most people use bore wells and municipal water for drinking and other domestic purposes.
- Overharvesting of water from coastal aquifers, SLR by variations in atmospheric pressures, expansion of summer, and melting of ice sheets and glaciers impose additional saline water intrusion. As a result, an aggravated saltwater intrusion is expected in many coastal stretches in the near future.
- High population pressure, intense human activities, inappropriate and indiscriminate landscape alterations, resource use, and the absence of proper management practices add to the deterioration of water resources.
- Saltwater intrusion affects the productivity of fishing, horticulture and livestock.

Reduction in capture fisheries:

- Climate change impacts the productivity of fisheries due to increase in SST, changing current patterns and upwelling affecting the fish reproductive biology, alteration of habitats and migratory routes.
- A decrease in capture fishery influences the per capita income, revenues, wealth, and socio-economic status of the fishing community.
- Conflicts in fish catch, an increase in poverty, migration of fishermen, shifting of occupation, and an increase in inequality are the consequences on fishing communities.

Way Forward:

- Poorer households are often less able to adapt and are more vulnerable to tackle climate change risks. Prioritisation of problems due to climate change based on the risk and vulnerability using the Livelihood Vulnerability Index shall support identifying the location-specific problems to mitigate climate change risks.
- Coastal habitats shall be demarcated and suitable locations for shelter during the flood which are the high elevated areas along the coasts shall be identified.
- In the potential saltwater intrusion areas and drought prone areas, sites for water tanks in the coastal habitats to mitigate the water scarcity problems due to climate change shall be constructed.
- The identified suitable evacuation location during cyclone and flood shall be informed to coastal communities through awareness creation activities, capacity-building activities, and mock drills.
- Fish stock trends and assessments shall be conducted to develop policies and schemes to replenish the economically important fishery resources with the involvement of local stakeholders.
- To reduce captured fishery demand from the natural coastal environment, nearshore cage culture, aquaculture, and mariculture activities shall be encouraged with the participation of local communities under Public-Private Partnership (PPP) mode.

KURUKSHETRA-NOVEMBER 2022 (SCIENCE AND TECHNOLOGY)

1. Technology and Innovation in Healthcare

Technological Progress and Digitalisation of Healthcare

- The global pandemic affected the whole world in 2020, and the necessity for robust medicare management was intensified due to the COVID crisis.
- The vulnerabilities highlighted during the pandemic have led to the adoption of digital technologies to continue to provide key healthcare services to patients, especially those who could not visit the healthcare facilities physically for treatment.
- Healthcare is slowly shifting away from healthcare facilities, focusing primarily on patient (home) facilities as the fear of the COVID infection reduced physical OPDs and technology is driving this transition.
- Virtual counselling through telemedicine has received a much-needed boost as teleconsultation has multiplied during the COVID pandemic.
- In 2020, the Ministry of Health and Family Welfare (MoHFW), NITI Aayog, and the Board of Governors (BoG) Medical Council of India (MCI) issued the Telemedicine Practice Guidelines. This regulation has helped to democratise the provision of health services.
- The application of digital technologies such as artificial intelligence (AI), machine learning (ML), data analytics, Internet of Things (IoT), cloud computing, and robotics is increasing in every facet of the healthcare system.

Emergence of Digital Healthcare in India

- Interoperability is the ability of systems to communicate with each other and make use of the information obtained through each other without any restrictions.
 - However, the Electronic Health Records (EHR) of people are not easily available to doctors, hospitals, pharmacies, etc. due to issues like security, permission, and cost which has affected the quality of healthcare available.
- In this context, the MoHFW notified the EHR standards for India in September 2013 and revised EHR Standards for India were notified in December 2016.
 - Further, the review report by the Ministry of Electronics and Information Technology (MeitY) named "Adoption of Electronic Health Records: A Roadmap for India" highlights that the country's public healthcare facilities have very little ICT infrastructure such as computers and connectivity.
- In the wake of the COVID pandemic, the **National Digital Health Mission (NDHM)** (Ayushman Bharat Digital Mission) was launched in 2020, which is the implementation of the **National Digital Health Blueprint** prepared by the MoHFW with an objective to create a framework for the National Health Stack proposed in 2018 by the NITI Aayog.
 - NDHM aims to create a single repository of medical records of all citizens.
 - Under the mission, every Indian will get a unique Health ID which will contain information about every test, disease, medicine, and associated reports.

- A comprehensive EHR would be beneficial to rural patients, as it could soon include data from digital devices that display information about the patient's health problems and could include information about their lifestyle and habits.

The Rise of Digital Healthcare Facilities in India

- The Internet of Medical Things (IoMT) is changing the nation's healthcare systems for the better. IoMT is the collection of medical devices and applications that connect to healthcare IT systems through online computer networks.
 - IoMT devices that are Bluetooth enabled can transmit all essential clinical data to the consulting physician in real-time thereby mimicking face-to-face consultation.
- McKinsey's latest report projects that telehealth will become a quarter-trillion-dollar industry post-COVID.
- The Atal Innovation Mission (AIM) under the NITI Aayog has been promoting innovation and entrepreneurship in the country. AIM supports the establishment of new incubation centres called Atal Incubation Centres (AIC), many start-ups and companies working on healthcare related services and equipment are being supported by these AICs.

Conclusion

- An effective healthcare system of a nation is determined by its ability to deliver high-quality and efficient care that is affordable and accessible for all.
- Access to quality healthcare has been a traditional problem in the country, especially in the hinterlands. However, government-led innovations are taking place at a rapid pace in rural communities.
- As teleconsultation, e-pharmacy, and remote monitoring have gained the trust of all stakeholders, more efforts have to be initiated to leverage other advanced technologies such as AI, ML, and Blockchain to enhance interoperability in healthcare as they also help create jobs and employment opportunities.
- Adopting an integrated approach for addressing both the public's health needs and investing in robust information and communications technology infrastructure is the way forward.

2. Conservation of Natural Resources

Introduction

- The term “environment” was introduced in the Constitution of India for the first time in the year 1976 through the 42nd Constitutional Amendment.
- The State’s responsibility with regard to environmental protection was laid down under **Article 48-A** of the Constitution which says that the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country.
- Further, **Article 51-A (g)** which deals with the fundamental duties mentions that “it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures”.

Environment related interventions by the government

- For the protection and conservation of the environment, several legislations have been passed by the government namely: the Environment Protection Act, 1986; Water (Prevention and Control of Pollution) Act, 1974; Water Cess Act, 1977; Air (Prevention and Control of Pollution) Act, 1981.
- Laws passed with respect to forests and biodiversity include: Wild Life (Protection) Act, 1972; Indian Forest Act, 1927; Forest (Conservation) Act, 1980; and Biodiversity Act, 2002.
- Recently the Government of India also unveiled LIFE (Lifestyle for Environment) initiative which aims to promote environment conscious lifestyle.
- To combat climate change, **Panchamrit** (five goals) were announced at the UN Climate Change Conference of the Parties (COP26) held in Glasgow which include:
 - India will increase its non-fossil energy capacity to 500 GW by 2030
 - Meeting 50% of India’s energy requirements through “renewable energy” by 2030
 - Reducing the total projected carbon emissions by one billion tonnes till 2030
 - Reducing the carbon intensity of India’s economy by over 45%
 - Achieving the target of “net zero” by the year 2070, when there will be no net carbon dioxide emitted from energy sources.

Technological Interventions by MoEFCC

- **PARIVESH:** In line with the spirit of “Digital India”, a single-window integrated environmental management system named PARIVESH (Proactive and Responsive facilitation by Interactive, Virtuous and Environmental Single window Hub) was launched by the MoEFCC in August 2018.
 - It has an automated process starting from submitting of application, preparation of agenda, preparation of minutes to grant of clearances.
 - It facilitates sound and informed decision-making, realtime information about the status of application.
- **Decision Support System (DSS):** DSS is a web GIS application developed to provide qualitative and quantitative information with respect to forest area.
 - It uses different spatial layers for providing the information like state and district boundary, tiger reserves, tiger corridors, forest type maps, biological richness, hydrological layer, etc.

- **Climate Change Knowledge Portal:** India’s Climate Change Knowledge Portal is a single point information resource that captures sector-wise adaptation and mitigation actions that are being taken by the various ministries in one place
 - The portal helps in disseminating knowledge among citizens about all the major steps the Government is taking at both national and international levels.
- **National Mission on Himalayan Studies:** National Mission on Himalayan Studies is a Central Sector Grant-in-aid Scheme that addresses key issues relating to conservation and sustainable management of natural resources in the Indian Himalayan Region.
 - The key objective is to focus on enhancing livelihoods of local communities in line with the National Environment Policy, 2006.
- **Wetlands of India portal:** This portal is an initiative to provide a single point access system that synthesises information dissemination regarding wetland sites of India.
 - The portal provides a platform for the people of the country to learn more about wetlands and get involved in their conservation and management.

Conclusion

- Environmentalist and green activist Dr. Anil P. Joshi has rightly stated that the true capital of a nation lies in its natural resources, and future demands balance between economy and ecology.
- Through science and technology, environment conservation can be achieved in a holistic manner as environmental attitude is directly linked with the level of knowledge regarding environmental issues.
- As the climatic conditions are changing, there is a need to spread awareness about the use of technology for environment protection as it will play an important role in sensitising people about environmental issues and facilitate people to adopt green social responsibility for the protection of the environment.

3. Smart Water Future

Water Scarcity in India

- On account of the increasing population, the per capita annual availability of water in India, which was 1816 cubic meters in 2001 has reduced to 1544 cubic meters in 2011 and is expected to reduce to 1140 cubic meters by the year 2050.
 - According to international agencies, any situation of availability of less than 1000 cubic meters per capita is considered scarcity.
- By 2030, India’s water demand is expected to be twice the available supply and if the trend continues, it may imply severe water scarcity for hundreds of millions of people.
- Another key aspect of water that requires immediate attention is the management of wastewater.
 - The country generates 140 Billion Cubic Metre of wastewater annually.
 - The per-person disease burden due to unsafe water and sanitation was found to be 40 times higher in India than in China and 12 times higher than in Sri Lanka in 2016.

Smart Water Future

- Smart Water broadly means the management and distribution of water while maintaining its quality.
- To ensure the sustainable supply of water in a smart format, the focus must be on the reduction of non-revenue water and encouraging wastewater recycling and reuse.
- Under the water supply management, loss due to non-revenue water can be considered a threat to water-scarce economies of the world.
- The International Water Association (IWA) has defined “Non-revenue water” as all physical and commercial losses due to theft, pipe burst, overflow of reservoirs, unmetered and ill-metered water bill along with unbilled authorised consumption.
- According to the World Bank, Indian utilities in 2012 face huge distribution losses due to non-revenue water, it has been estimated that about 40-70% of water distributed, is lost on account of leakages, unauthorised connections, billing and collection inefficiencies. Therefore reducing non-revenue water losses has become important.
- There are four basic leakage management activities that can be undertaken by water utilities to reduce distribution losses, namely:
 - Pressure management
 - Active leakage control
 - Speed and quality of repairs and pipe asset management
 - Maintenance and renewal

Use of Technologies to Facilitate Smart Water Management

- Active leakage control can be achieved by technological interventions such as real-time monitoring of water supply infrastructure, use of geographic information systems (GIS) tools, installing smart devices, and telemetry.
- Implementation of Internet of Things (IoT) technology helps transmit data or information about water usage to longer distances through wireless, and uninterrupted means.
- The use of Sensors, remote sensing technologies, and visualisation tools help manage water resources at the service area, watershed, and regional scales.
- Satellites and drones can be used to provide data for mapping water resources, measuring water fluxes, and utility asset management. Data from such technologies can better prepare water resource management policies.
- Mobile phones can be utilised to provide near real-time data on water quality, flows, pressures and water levels, among other parameters. It can also help in spreading useful information on water resources to all the stakeholders.
- Smart meters can be used to record customer water usage that will provide a clear picture of water consumption and convey data to both consumer and utility.
- Artificial Intelligence in water can allow for the strategic and cost-effective operation of utilities, including better planning and execution of projects, better tracking and understanding of resource loss and more efficient collection and distribution networks.

- Further, the use of AI in reservoir operation, flood forecasting, and inundation mapping can help to mitigate floods and save thousands of lives.
- Augmented Reality and Virtual Reality technologies have the potential to support decision-making in the field by providing holographic representation of pipes, cables and other assets and facilitate immersive scenario-based training.
- Blockchain applications have the potential for direct, secure transactions between resource providers and consumers and other players.

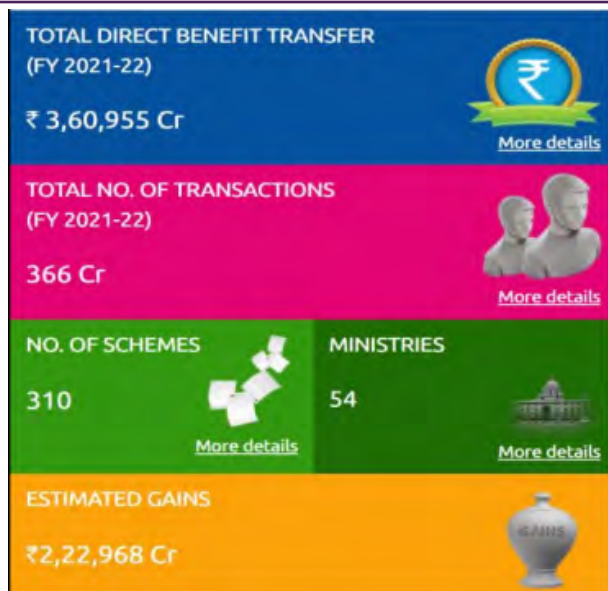
4. Technology - Empowering the Masses

The role played by Technology in Empowering the Masses

- For a developing country like India, science and technology play a huge role in bettering the lives of its citizens.
- In India, science and technology have a huge potential to revolutionise agriculture, financial inclusion, education, roads and transport, healthcare and housing sectors.
- Technological interventions not only help boost productivity, better service levels and efficiency but also help ensure that the benefits of modern science reach the bottom of the pyramid, ensuring ease of living and access to various government schemes.
- Technology has been the proverbial catalyst in turning the tide in favour of citizens and their ability to access government schemes.
 - For example, the rapid adoption of digital technology in the last few years has laid the framework for making the delivery of government schemes easier and more efficient.

Key developments spearheaded by Technological Advancements

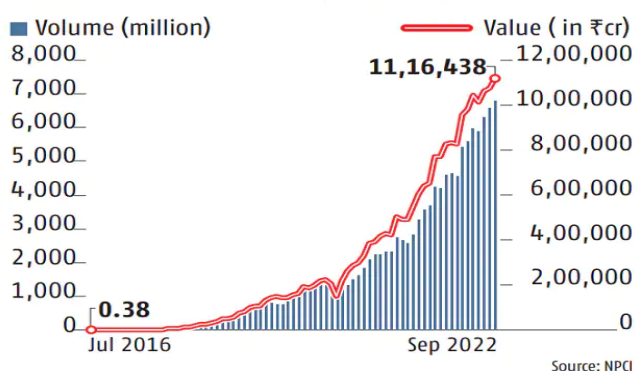
- **India Stack and Aadhaar:** The foundation of India's digital revolution was laid by the development of India Stack which is a unified software platform that brought over 140 crore-plus population of India's into the digital age.
 - The adoption of India Stack has helped promote financial and social inclusion.
 - The bedrock of India Stack is a set of digital identity products centred around Aadhaar and Aadhaar has also been the foundation of multiple Building Blocks.
- **Direct Benefit Transfer:** Aadhaar identification programme has ensured the success of the Direct Benefit Transfer (DBT) system which was initiated by the government in 2013.
 - The main aim of the programme was the transfer of subsidies and cash benefits directly to citizens through their Aadhaar seeded bank accounts which reduces leakages, and associated delays
 - DBT has emerged as a high priority focus area of the government, in reforming the government delivery system in a variety of welfare schemes for a simpler and faster flow of information/funds.
 - DBT has become the most accepted way of delivering development schemes with the delivery of over 450 schemes such as the PDS, PM-KISAN, MGNREGS, Prime Minister's Matru Vandana Yojana (PMMVY), National Health Mission, etc.



Source: PIB

- **Digital Platforms for e-Governance:** The National Informatics Centre (NIC) under the Ministry of Information Technology is playing a huge role in executing key IT projects, in collaboration with Central and State Governments ensuring the last-mile delivery of government services.
 - NIC has also developed various digital platforms for the socioeconomic development of the country in line with the vision of "One-Nation One-Platform".
- **Unified Payments Interface (UPI):** The UPI developed by the National Payments Corporation of India (NPCI), has emerged as a game changer in the payments space.
 - Rolled out in 2017, UPI accounts for about 16% of total retail payments, with over 30 million UPI QR codes registered by merchants.
 - With UPI other digital payment options such as Bharat Bill Payment System (BBPS), BHIM Aadhaar, Aadhaar Enabled Payment System (AePS) and *99# services have also developed.

PREFERRED PAYMENT MODE



Source: Business Standard

- **Smart Cities Mission:** One of the most visible examples of the impact of technology in changing the lives of our people is the evolution of our Smart Cities.
 - Launched in 2015, the Smart Cities Mission (SCM) identified 100 cities across the country for higher economic growth and better quality of life for people by enabling local area development and harnessing technology.

- **Integrated Command and Control Centre (ICCC):** ICCCs are said to be the nerve centre in each Smart City.
 - ICCCs monitor all the activities taking place in the city from a technology enabled and responsive, central location and are designed to aggregate the information across multiple applications with the help of sensors deployed.

5. Non-conventional Energy Sources

Non-conventional Energy sources

- Non-conventional energy sources refer to those renewable sources of energy that are obtained from nature and are replenished at a rate faster than their consumption unlike conventional energy sources such as coal and natural gas.
- These energy sources do not get depleted when used hence they are inexhaustible.
- Further, they are regarded as clean sources of energy as they are less hazardous compared to conventional sources of energy.

Significance of Non-conventional Energy sources

- Transition to non-conventional sources of clean energy ensures the attainment of three Es in energy policies namely energy security, economic development and environmental sustainability.
- The shift towards non-conventional sources of energy will make this planet a better place to live as they not only help address the issue of climate change and global warming but also contribute to better public health outcomes.
- The shift towards non-conventional sources of energy can help reduce the cost of energy supply and also ensure enhanced delivery of affordable clean energy that is accessible to all.
- The transition to renewable energy sources will aid the Indian economy to delink itself from volatile international oil prices and also ease the burden of subsidies.
- Further, the transition to non-conventional sources of energy leads to more employment and entrepreneurship opportunities and boosts exports.

Popular Non-conventional Energy sources in India

- **Solar Energy:** Solar energy can be harnessed by converting solar energy into electric energy in solar plants.
 - India, being a tropical country and its geographical location makes Solar energy a conducive source of energy.
 - Solar energy has penetrated the rural belts of the country making and has evolved as one of the key sunrise sectors with a lot of potential.
 - The country's need for solar energy has led to the introduction of the Production Linked Incentive (PLI) scheme for manufacturing of solar Photo-Voltaic (PV) modules with an outlay of Rs. 24,000 crores.
 - The scheme is expected to create an additional 10,000 MW capacity of integrated solar PV manufacturing plants and reduce imports of solar PV cells and modules and provide adequate impetus to R&D.

- o India has achieved 5th rank globally in solar power deployment by surpassing Italy and the efforts of the Government have led to the increase of solar power capacity by over 11 times.
- **Wind Energy:** The kinetic energy of wind in motion is used to generate wind energy.
 - o The expansion of the wind industry in the country has created a strong ecosystem with a manufacturing base of about 10,000 MW per annum.
 - o India with its long coastline of around 7,500 km has immense potential in harnessing offshore wind energy.
- **Tidal Energy:** The energy produced from the surge of ocean i.e from the rise and fall of waves is called tidal energy.
 - o Tidal energy is yet to take a full fledged form for commercial purposes and is still in the R&D phase.
 - o Relatively high cost and limited availability of sites with sufficiently high tidal ranges or flow pose constraints on its total availability.
- **Geo-thermal Energy:** The energy generated from the heat derived from the subsurface of earth is called geo-thermal energy. The gradual decline of radioactive particles in the earth's core generates geo-thermal energy.
- **Hydropower:** Hydropower, or hydel power, is considered one of the oldest and largest sources of renewable energy. It generates electricity by harnessing the flow of water.
- **Biomass Energy:** Biomass energy is generated by living organisms or organisms that lived earlier.
 - o Biomass is an organic material and contains stored energy obtained from the sun. Burning of biomass results in the release of chemical energy in biomass in the form of heat.
 - o According to the Ministry of New and Renewable Energy (MNRE), about 32% of the total primary energy use in India is still derived from biomass and more than 70% of the country's population depends on biomass fuel.
- **Fuel Cell:** This refers to the source of energy that uses hydrogen and oxygen to generate electric power. Through chemical reactions with oxygen, fuel cells convert hydrogen obtained from diverse sources, into electricity.
 - o Water is the only end product of this process, making it a clean and sustainable energy source.
- **Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan (PM-KUSUM):** PM-KUSUM aims for de-dieselisation of the farm sector along with providing energy security and increased income to farmers.
 - o The Scheme with a financial support of over Rs.34,000 crores from the Central Government has aimed to create additional 30.8 GW of solar capacity.
 - o PM-KUSUM has three key components namely:
 - Creation of 10,000 MW of Decentralised Ground mounted grid connected solar power plants
 - Solarisation of 15 lakh grid connected agriculture pumps
 - Installation of 20 lakh agriculture pumps powered by solar energy
- **Rooftop Solar Phase-II Programme:** Under this Programme 4000 MW rooftop solar (RTS) capacity addition is targeted through Central Financial Assistance (CFA) in the residential sector including for households in rural areas.
- **National Hydrogen Mission:** The mission aims to make India a green hydrogen hub and help India to fulfil its target of production of 5 million tonnes of green hydrogen by 2030.
- **National Offshore Wind Energy Policy:** Notified by the Government of India in 2015 the policy aims to develop offshore wind power in the country.
- **National wind solar hybrid policy:** Adopted in 2018 by MNRE, it aims at providing a framework for promotion of large grid connected wind-solar PV hybrid projects for optimal and efficient utilisation of transmission infrastructure.

Challenges in Transition to Non-Conventional Energy Sources

- The challenges of expanding power infrastructure to permit increased use of diverse energy sources and ensuring system flexibility.
- Lack of investor confidence in the renewable energy sector.
- International green finance flows to India have been relatively low when compared to India's climate goals.
- The ecosystem of green finance is impeded by issues such as long gestation gaps, increased capital cost, potential risk factors associated, etc.
- Further, coping with immediate job and revenue loss due to switching from fossil fuels will also be a challenge.

Way forward

- Addressing key challenges require strategic planning for raising necessary finance and upskilling human resources.
- To facilitate a smooth and sustainable transition to non-conventional sources of energy, mobilisation of green finance needs to be adopted at a faster rate.
- Greater deployment and optimal utilisation of innovative financial instruments like green bonds, crowdfunding, and infrastructure debt bonds play a key role in this regard.
- Facilitating increased public private partnership for funding and meeting necessary technological requirements is also important.

Governmental Interventions to Foster Non-conventional Energy sources

- **Permitting Foreign Direct Investment (FDI) up to 100% under the automatic route** for renewable energy projects.
- Setting up of **ultra-mega renewable energy Parks** to provide land and transmission to renewable energy developers on a plug and play basis.
- **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 transmission lines and creating new sub-station capacity for evacuation of renewable power under **Green Energy corridor scheme**.

- It is also crucial to further escalate R&D expenditure on the domain of clean energy sources as it will boost innovation, and aid in the creation of resilient energy systems.
- Ensuring greater synergy among all the concerned stakeholders through a participatory approach can further help to fasten the pace of the shift towards renewable sources.

6. S&T Towards Women Empowerment

Initiatives undertaken by the Government to encourage Women in the field of S&T:

- The former Prime Minister Atal Bihari Vajpayee had declared the year 2001 as the “**year of empowerment of women**”.
- The **Science and Technology Policy, 2003** emphasised to promote the empowerment of women in all science and technology activities and ensuring their full and equal participation.
- **National Task Force for Women in Science:** In 2002, the President of Indian National Science Academy (INSA) constituted a committee to examine the status of women in science in India.
 - The recommendations of the INSA report on “Careers of Women in Science” prompted the Scientific Advisory Committee of the Prime Minister to constitute a National Task Force for Women in Science in December 2005 under the Department of Science and Technology (DST).
- **Recommendations of Task Force:** The task force made several recommendations including:
 - Recruitment of deserving women scientists in institutions,
 - Selection committees to include women scientists
 - Refresher training, mentorship programs and schemes
 - Creating women friendly workplaces with availability of creches and safeguarding policies against sexual harassment
 - Promote scientific temperament among school girls
 - New policies with focus on maternity leave
 - Developing avenues to promote entrepreneurship and self-employment
- **Women Scientist Scheme (WOS):** WOS-A provides opportunities to women researchers who have taken a break in a career primarily due to family responsibilities, relocation, etc. for pursuing research in basic or applied areas of science and engineering.
 - WOS-B provides grant support to women scientists for developing S&T solutions for solving grassroots level issues and promoting social benefit.
 - WOS-C provides a one-year internship in the domain of Intellectual Property Rights (IPRs).
- **CURIE Programme (2008-09):** One of the major goals that were identified by the National Task force was to increase the number of women in S&T by providing them access to cutting edge S&T infrastructure and promoting scientific skills training.
 - The DST conceptualised and initiated the Consolidation of University Research for Innovation and Excellence in Women Universities (CURIE) and supported nine women universities across India in enhancing their R&D infrastructure.

- Currently, the program is expanding its focus to improve STEM education and research in post graduate colleges to provide education to girls in small cities.
- **Mobility Scheme:** the scheme offers a contractual research award towards conducting independent research in any location as women face difficulties in their present job due to relocation (due to marriage, transfers, etc.)
 - This helps women to undertake research during early phases of their career while fulfilling key domestic responsibilities.
- **Biotechnology Career Advancement and Reorientation Programme (BioCARE):** Launched by DBT in 2011 the programme helps in career development of employed/ unemployed women researchers by providing extramural research grant support.
- **Knowledge Involvement in Research Advancement through Nurturing (KIRAN):** It is a division reconceptualised at DST in 2014 to cover all the women-exclusive schemes to bring gender parity in S&T and provide a framework for gender mainstreaming.
 - It supports Women Scientist Scheme (WOS), CURIE Programme and the Mobility scheme.

Recent Developments

- **Vigyan Jyoti** is a programme introduced by DST in the year 2019-20 with an aim to provide exposure to meritorious young girls in tier 2 cities and remote and rural areas to pursue a career in STEM.
 - The programme promises hand-holding and mentoring for girls from their school stage till PhD.
- On 28th February 2020, India celebrated National Science Day with “**Women in Science**” as the focal theme.
- The DST has launched **GATI (Gender Advancement for Transforming Institutions)** as a mission mode program that aims to push higher education institutions, research institutes and universities towards supporting diversity, equity and inclusion (DEI)
- **Women technology parks** are centres that are strategically placed near women farmer communities to facilitate demonstration of methodology by scientist-cum-technologists.

7. Science and Technology in Agriculture

Use of Digital Technologies in Agriculture

- The Committee on Doubling Farmers’ Income in its report 2018 has highlighted the role of digital technology, which can play a transformational role in modernising and organising how rural India performs its agricultural activities.
- Digital technologies are finding increasing use in the agricultural value system, and farmers are increasingly becoming more informed, as various measures are taken to provide them ready access to technology and information.
- The Government has finalised the core concept of **India Digital Ecosystem of Agriculture (IDEA) framework** which lays down the architecture for the federated farmers database.

- o The IDEA would serve as a foundation to build innovative agri-focused solutions leveraging emerging technologies to contribute effectively in creating a better ecosystem for agriculture in India.
- o This ecosystem shall help the Government in effective planning towards increasing the income of farmers in particular and improving the efficiency of the agriculture sector as a whole.
- Under the **National e-Governance Plan in Agriculture (NeGP-A)**, the funds are released to the States and UTs for projects involving use of modern technologies such as AI, ML, Robotics, Drones, Data Analytics, Block Chain, etc.
- o Financial assistance is provided digitally in the form of Interest Subvention and Credit Guarantee for setting up post-harvest management Infrastructure
- **National Project on Soil Health and Fertility:** The Government has recommended soil test based balanced and integrated nutrient management through conjunctive use of both inorganic and organic sources
 - o The project recommends a 4Rs approach namely right quantity, right time, right mode and right type of fertiliser for judicious use of chemical fertilisers
 - o Further, integrated Nutrient management has been promoted through the implementation of Soil Health Cards scheme since 2015.
- **Kisan Suvidha App:** The development of Kisan Suvidha mobile application aims to facilitate dissemination of information to farmers covering range of issues such as weather forecast, extreme weather alert, market price of commodities, information about dealers of fertiliser, seeds, pesticide, soil testing labs, crop insurance government schemes, etc.
 - o Besides, **Pusa Krishi mobile app** provides information about the latest technologies developed by the Indian Agricultural Research Institute.

Various S&T interventions in the Agriculture Sector

- **e-NAM:** The National Agriculture Market (e-NAM) is a pan-India electronic trading portal that networks the existing Agricultural Produce Market Committee (APMC) mandis to create a unified national market for agricultural commodities.
 - o Digital services are provided to traders, farmers, Farmers Producer Organisations (FPOs), mandis through various modules of e-NAM platform
 - o In July 2022, the Agriculture Ministry launched the **Platform of Platforms (PoP)** under e-NAM intended to promote trade and marketing of agricultural produce wherein farmers will be facilitated to sell the produce outside their state borders.
- **PM KISAN Digital Payment:** Under the PM KISAN scheme, Rs. 6,000 is directly transferred into the bank accounts of the eligible farmers under DBT mode annually in three installments.
 - o The PM-KISAN mobile app was launched to broaden the reach of the scheme where farmers can view the status of their application, update or carry out corrections of name based on their Aadhaar card and also check the history of credits to their bank accounts.
- **AGMARKNET portal:** Integrated Scheme for Agricultural Marketing schemes to promote creation of agricultural marketing infrastructure by providing backend subsidy support to State, cooperative and private sector investments Services are provided through AGMARKNET portal.
 - o AGMARKNET portal is a G2C e-governance portal that caters to the needs of various stakeholders such as farmers, industry, policy makers and academic institutions by providing agricultural marketing related information from a single window.
- **National Mission on Horticulture:** This mission promotes holistic development of the horticulture sector (including bamboo and coconut).
 - o HORTNET project is a web enabled work flow-based system for providing financial assistance under the mission for Integrated Development of Horticulture.
- **Agriculture Infrastructure Fund:** This was created to mobilise a medium to long term debt finance facility for investment in viable projects for post-harvest management Infrastructure and community farming assets through incentives and financial support
- **Usage of Drones in Agriculture:** To promote the use of drones in agriculture, the Department of Agriculture and Farmers Welfare has released the SOPs for use of drones in pesticide and nutrient application
- **Thrust on Genetic Improvement:** The government's thrust has been on the use of new technology in agricultural research.
 - o The research by ICAR focuses on genetic enhancement of crops, livestock, fish for high yield, quality and climate resilience, conservation of resources and, development of intelligent information technology enabled platform for technology transfer among farmers and stakeholders.

8. Technology and Innovation in Rural Economy

Scope of S&T in Rural Economy

- Agricultural Information Systems can provide access to information through platforms.
- Monitoring the situation of natural resources and environmental impact through different information processing tools
- Education and Communication Technologies can play a significant role in generating new approaches to learning and knowledge management
- Networking is another key area where S&T can contribute greatly to facilitate effective communication between people and institutions
- Decision Support Systems (DSS) help in data and information sharing which provide relevant knowledge on inputs for informed decision-making

Key Efforts Undertaken by the Government

- The Government has rolled out schemes for education, financial literacy, agri-tech and skill development that cater to nearly 50 crore people living in rural regions.
- Digital literacy and connectivity have strengthened the labour market and provided a platform to educate and become financially independent.

- In April 2016, the Government of India launched **e-NAM (National Agriculture Market)** online platform for farmers that integrates agricultural markets pan-India with a theme of “one nation-one market”.
- Saving and conserving rain water for creating appropriate rainwater harvesting structures has been the key objective of the Government which has been investing in mapping all of India’s aquifers.
 - In this context, the **National program on Aquifer Mapping and Management (NAQUIM)** facilitates 3D mapping of the aquifers and characterising them in terms of quantity, quality and spatial and temporal distribution of water level.
- The Union Budget of 2022 has also pushed for an array of digital technologies and drones to propel growth in the farm sector.
- **Technological Advancement for Rural Areas (TARA):** This scheme under the **Skill Enhancement Education and Development Program (SEED)** is providing long-term core support to science-based voluntary organisations and field institutions in rural to promote and nurture them as “S&T Incubators” and “Active Field Laboratories”.
- The country’s gram panchayats are linked to **National Optical Fibre Network (NOFN)** with the help of Public Sector Undertaking (PSU) fibres filling the connectivity gap between gram panchayats and blocks.
- **Common Service Centres (CSC):** CSCs are a part of the Digital India mission are serving as the access points for essential public utility services, social welfare programmes, healthcare, finance, education, agriculture and a variety of services to citizens
- **Digital India Land Records Modernization Programme (DILRMP):** DILRMP is a scheme aimed at leveraging existing commonalities in land records to develop an appropriate Integrated Land Information Management System (ILIMS)

Significance of S&T in Rural Economy

- Digitalisation will go a long way in reducing traditional bottlenecks such as shrinking markets and low density that have been roadblocks in building sustainable rural economies and can also create new growth opportunities.
- Technological advancements can help lower trade expenses, allowing rural areas to tap into new markets as the rural goods and services can reach more distant markets at a lesser cost and at a faster pace.
- In rural economies, advanced technology can also help to improve the entrepreneurial business environment.
 - **Example:** 3D printer technology has the potential to make small-scale production more cost-effective.
- The surge of start-ups attracts new players into the market to offer more technology-based solutions.

SCIENCE REPORTER

1. Flying Cars: The next step to urban e-mobility

Context: Recent technological developments have promised mobility by flying cars becoming a fact rather than a fiction, sooner than expected.

What makes this possible?

1. The persistent pressure on urban mobility
2. The availability of drones which can big loads
3. Improvements in electric car batteries

What is eVTOL

- The emerging class of flying cars is called eVTOL or electric Vertical Take Off and Landing.
- They can take off vertically, fly horizontally and land vertically.
- They have more similarities to drones than conventional helicopters or airplanes.

How do eVTOLs work

- They are powered by Lithium-Ion batteries.
- They take off like helicopters, then switch to an airplane mode for the flight and finally come back to helicopter mode for the vertical descent.
- They operate like drones.
- Their large omnidirectional fans enable the craft to rise and move in any direction.
- Their fans and propellers harness what is known as “distributed electric propulsion”
- Most eVTOLs have more than one motor; some work with each rotor, while a separate motor provides forward thrust
- In case of battery failure, they fall back on a small conventional fuel engine that can bring it safely back to the ground.

Background

- The first concept of an electric VTOL came in 2009 by Mark Moore, a NASA engineer, who proposed a personal one-man air vehicle ‘Puffin’.
- Many aircraft makers like Boeing, Airbus, Embraer and Bell Helicopter took the idea forward.
- Airbus’s eVTOL ‘Vahana’ from the Sanskrit for ‘vehicle’ was unveiled at the 2017 Paris Air Show: a 8-propeller driven, single-passenger, self-piloted flying car.
- Uber launched an air taxi project called ‘Elevate’ and has signed up with a California start-up, Joby Aviation, to make the flying vehicles.
- German company, Volocopter, completed its first test flight of the VoloConnect, a four-seater that can fly 75 km on a single charge in 2022.
- On 21 May 2022, the Swedish company Jetson claimed the honour of the world’s first eVTOL commute.

Indian eVTOL: Partnership Route

- The Suzuki connection: The first flying by Japan, the SD-03 from SkyDrive, passed all safety tests in November 2021.
- Suzuki announced a R&D partnership with SkyDrive for manufacturing and mass production, with a focus initially on the Indian market.
- Suzuki has made large investments in electric vehicles and battery manufacturing in Gujarat.
- Tech Mahindra partnered with Los Altos (California, US)-based ASKA NFT, to develop four-seater electric ‘drive-n-fly’ vehicles.
- L&T has won a \$100 million deal from Texas based Jaunt Air Mobility. The Indian company will provide engineering services at a future R&D centre in Montreal, Canada, alongside Jaunt’s manufacturing unit.

Design and Make in India

- Two Chennai based initiatives are a bit ahead on the eVTOL development:
 1. The ePlane Company was incubated at IIT Madras and was co-founded in 2017 by Professor Satya Chakravarthy, having named their eVTOL ‘e200’.
 2. Vinata Aeromobility, another Indian start-up, is working to perfect ‘Asia’s first hybrid flying car’.

Disrupting the Future of Mobility

- The electric vertical take-off or landing aircraft will possibly fly commercially by 2024 and could become mainstream in the 2030s.
- It will act as a ride-hailing and ride-sharing service within and between cities.
- eVTOL can address road congestion, improve productivity and increase accessibility for rural and disadvantaged communities.
- As compared to ground taxi services, “advanced air mobility would be three to five times faster at a comparable cost and with fewer carbon emissions.”

Conclusion:

The future of eVTOL appears very promising and it seems flying personal transportation is a technology whose time has come. Therefore, Indian start-ups and the government both need to join hands to take a lead in eVTOL, given the potential the technology holds for the transportation sector.

2. Age ready cities

Context: The steady rise in global elderly population and model of urbanization needs to be in sync for an age ready city.

What is the need

- Due to urban vulnerability specifically during disasters and pandemics as shown during the recent COVID outbreak.
- Encroachments of wildlife habitats and climate change
- During the pandemic incidents like ‘Amphan’ cyclone showed how cities might get affected

The vulnerable

- Extreme weather conditions and COVID-19 affected and killed the elderly in large numbers.
- This age group needs hospitalisation, intensive care or ventilators.
- There is a need to evaluate how deepening urbanization can be made age-friendly?
- As per IPCC elderlies exposed to extreme events like river or sea level rise, heat waves, floods, cyclones, wildfire, droughts, etc. has increased and is projected to increase.

Who are the 'Elderlies'

- Persons aged 65 and older as per World Health Organization and Organization for Economic Cooperation and Development etc.
- National policy for older persons, 1999, considers senior citizens as aged 60 or more.

Rise in elderly population

- Steadily increasing in India since 1961.
- During 2001-2011- grew by more than 27 million; during 2011-2021- grew by 34 million and from 2021-2031- expected to grow by 56 million
- The growth rate of the elderly Indian population is higher than that of the general population elderly population grew by 36%.

The benefits of age friendly cities

- Allows to contribute economically and permits citizens of all ages and abilities to lead full, productive and dignified lives.
- Lesser expenses in maintaining health and well-being overall

How to achieve

- Authorities need to focus on universal design, housing solutions, multi-generational spaces, physical mobility, efficient spatial forms and accessible technology.

Projections for the future

- The data has shown striking characteristics about the Indian elderly population.
- India has 40 cities with more than a million population, 396 cities with between 1,00,000 and 1 million population and 2500 cities with between 10,000 and 1,00,000 Population.
- There is a statewide difference e.g. Kerala (16.5%) is expected to have the highest elderly population, and Bihar (7.7%) is likely to have the lowest population.
- NSO's national sample survey data shows 70% of the elderly in India are dependent on others for their daily living.
- This dependency is higher in the female population.

Issues

- The most common disabilities: locomotor disability (5.5%), followed by hearing disability (1.6%) and visual disability (1.4%).
- According to the first Longitudinal Ageing Study in India (LASI) released by the Union Ministry of Health and Family Welfare, two in every three senior citizens in India suffer from chronic diseases.
- Around 23% of the elderly population have multi-morbidities.

- Elderly women are more likely to have multi-morbidity conditions. The percentage of people without morbidity consistently declines with age.

Solutions:

1. Universal Design Towards Age-readiness

- We need to design elements for good acoustics and noise control.
- Cover design for appropriate visual conditions, including placement of light sources, level of illumination and adequate signage, built-in non-acoustic alerting and notification systems and augmented telecommunication systems.

2. Housing Solutions

- Adapted to their physical and cognitive needs to enable them to lead independent, safe and dignified lives.

3. Creating Multi-generational Spaces

- Physical spaces that often reinforce social exclusion and isolation.
- Generational segregation can have significant mental health costs.

4. Accessible Technology

- Digital platforms, applications, robotics, artificial intelligence and machine learning can ease the lives of older persons, their caregivers and service providers by enabling older persons to live independently longer by enhancing their social connections, access to services and can greatly improve their overall well-being.

5. Age Readiness Through Improved Transportation

- Prioritizing the accessibility, wheelchair accessible, barrier free spaces needs to be conflated while designing infrastructures.

6. Efficient Spatial Forms

- Effective spatial planning allows resources and services to be concentrated rather than spread out.
- Concept of '15 minutes cities' is an example where everything residents need on a day-to-day basis is within a 15-minute radius.
- China (Guangzhou and Shanghai) have incorporated this concept in their master plans.

Conclusion:

With better building codes, land use, waste management, and pollution control, we can protect the elderly as well as other populations during disease outbreaks or extreme events. Innovations in city infrastructure along with health infrastructure will help to make cities age-ready.

3. Phosphorous: Life's bottleneck

Importance

- It is a part of three primary nutrients – referred to as NPK
- Essential for seed germination, a good root system in young plants.
- Makes the backbone of DNA, cellular membranes, and a crucial component in the molecule adenosine triphosphate or ATP – the cell's main form of energy storage.
- The average adult needs about one gram of P a day.
- Normally, a human body contains about 650 grams of P, most of it in the bones.

Current scenario

- The fading 'P' reserves across the world is a concerning story.
- Not a physically scarce resource, widespread in the Earth's crust and in living organisms.
- More than 90 percent are not technically extractable.
- The only cost-effective production method is the mining of P-rich minerals.
- It is a finite resource that cannot be manufactured.
- Sooner within this century – the existing phosphate may fall short to meet global demand.

Geographical Distribution

- Phosphorus-rich minerals are concentrated geographically.
- Four countries – the US, China, South Africa and Morocco hold 83 percent of the world's easily exploitable phosphate rock and contribute two thirds of annual production.
- Around 40 percent of global reserves are controlled by Morocco, which has been called the 'Saudi Arabia of phosphorus'.
- Therefore phosphorus is a geo-strategically ticking bomb.

Indian Scenario

- 98 percent of the districts have low and medium P levels
- The heavy dependence on fertilizer imports (90 percent), and the huge subsidy burden of the government make India highly vulnerable.
- There is a link between P and food security.

The P Cycle

- Land ecosystems cycle P at an average of 46 times.
- The minerals' weathering and runoff takes P to the ocean, where marine organisms recycle around 800 times and pass into sediments.
- Over millions of years tectonic uplift returns it to dry land.
- It also leads to eutrophication, algal blooms and dead zones creation in water bodies.

New sources and innovative solutions

- Half of the P we excrete is in our urine, from which it would be relatively easy to recover.
- Using specialized toilets we can separate and extract P from human wastes.

Conclusion

As we are running out of this crucial mineral, we do need to find its deposits that are easily and chiefly exploitable. Therefore, we must act now to conserve it, and innovate alternatives.

4. ISRO's SSLV mission

Context: The inaugural flight of the new Small Satellite Launch Vehicle (SSLV) ran into rough weather and placed satellites in the wrong orbit.

What is SSLV

- New launch vehicle of ISRO, developed to lift small satellites (mini, micro or nano satellites 10 to 500 kg) at lower cost than Polar Satellite Launch Vehicle (PSLV).

- It has a payload capacity of up to 500 kg at 45° inclination to a 500-km low Earth orbit or 300 kg to a 500-km altitude sun-synchronous polar orbit.
- SSLV can carry different combinations of CubeSats, and micro or mini-satellites into orbit.
- It is a three-stage solid propellant vehicle having liquid propulsion based terminal stage VTM.
- SSLV has low cost NavIC integrated inertial navigation system
- The vehicle is also capable of supporting multiple orbital drop-offs, launch-on-demand.

SSLV vs PSLV

- SSLV is a much simpler version of PSLV.
- It provides low-cost access to space on-demand basis.
- It is ready to transfer vehicles with modular and unified systems and standard interfaces for end-to-end industrial production.
- The SSLV can be manufactured in about seven days, set-up in 72 hours, by a team of six people as compared to PSLV that requires a larger team and over 60 days of lead time to be ready for a mission.
- The SSLV has initial developmental cost- around ₹170 crore, and subsequently cost per launch- about ₹30 crores. PSLV cost at about ₹200 crore.
- The other contemporary launch vehicles to SSLV are Minotaur I (US), Start-1 (Russia) and Kuaizhou (Chinese)

The Payloads

- The primary payload for SSLV D-1 was EOS-02 and the second partner was AzaadiSAT.
- EOS-02: EOS-02 (earlier called Microsat-2A) was a small experimental earth observing satellite. It was to be placed in a 356 km low earth circular orbit.
- AzaadiSAT: It was an 8-Unit CubeSat structure weighing around 8 kg.
- It carried 75 different payloads each weighing around 50 g and conducting femto-experiments (experiments of small size).
- It was to mark the 75 th anniversary of Independence.
- The satellite was built by 750 girl students (predominantly class 8-12), 10 each from 75 rural schools across India.
- This was a first of its kind 'All women space mission' as part of promotion of this year's UN theme "Women in Space".

What Went Wrong?

- All events up to the velocity trimming module ignition went well as expected. The problem appeared at the SSLV's terminal stage VTM.
- The VTM was planned to burn for 20 seconds but it burnt for only 0.1 seconds, denying the altitude boost.
- Although both the satellites were separated, they missed their intended orbital trajectories, and entered into a 356 kmx76 km elliptical orbit instead of 356 km circular orbit.

Conclusion

Although the first test launch of SSLV was not entirely successful, it did pave the way for a new era of small and cost effective rocket launches. It will go a long way in facilitating countries and private players to chase their dreams sooner than later.

5. Magnetotactic Bacteria

What are they?

- Magnetotactic bacteria are prokaryotic single-celled microorganisms, lacking a distinct nucleus or well-defined cell organelles..
- The name comes from 'magneto taxis' or the ability to align and coordinate along the earth's magnetic field lines.

Habit and Habitat

- Both freshwater and marine, oxic-anoxic regions
- Anaerobic nature and do not require oxygen for cell functions.

Features

- They produce nano-sized magnetic crystals called magnetosomes.
- Magnetosomes are like tiny magnetic compasses, used for moments to direct them toward favorable living conditions.
- Magnetotactic bacteria are expert swimmers.
- They move northwards in the Northern hemisphere, southwards in the southern parts, and in both directions in the equatorial regions.
- They release particular iron-binding molecules called siderophores in their surroundings.
- Siderophores have a high affinity for Fe^{3+} ions and attach to them, after which they are absorbed inside the cell.
- Once inside, the ferric ions are cleaved from these molecules.
- The magnetosome chain helps to decipher the orientation of the earth's magnetic field.
- The chain generates a magnetic field of about 0.5 Gauss, creating a magnetic moment (energy) in the organism.

Key Players of Earth's Iron Cycle

- Magnetosomes are stable particles and retain their structure and composition even outside the bacterial cell.
- They contain 3% iron by dry weight (10^{-13} to 10^{-15} grams of iron per cell).
- Play a crucial role in iron recycling, replenishing up to 10% of the mineral in their environment.
- After death magnetosomes deposit as magneto-fossils or are ingested by other organisms completing the cycle.

Potential use

- Potential in new-age cancer therapies using external magnetic fields
- No need to fear toxicity as they are non-toxic and do not degrade in body fluids.
- Can be employed in localized radiation (hyperthermia) and kill cancer cells.
- Localized chemotherapy – by manipulating the outer layer coating with drugs and directing to the cancer site.

DOWN TO EARTH

1. Expansion by degree

Context: In the past 15 years, the Central government has gained control of nearly 1,300 sq km forests that were so far owned exclusively by forest and tribal communities of India

Introduction:

- Conservation reserve is one of the important units for ensuring that forests are being protected and illegal deforestation activities are curtailed.
- Looking into the importance of these patches of the forest they are given legal protection **under the Wildlife Protection Act, 1972**.
- Earlier, these forest reserves were being protected by the local people through village communities, but recently there has been a huge drive to make these reserves as a part of government protected area.
- Since **2007, it has brought nearly 1,300 sq km to an area just smaller than the National Capital Territory of Delhi under its control in eight states**.
- The pace of the spread too has increased, with **over 1,000 sq km added since 2015 in four northeastern states of Nagaland, Meghalaya, Manipur and Arunachal Pradesh**.

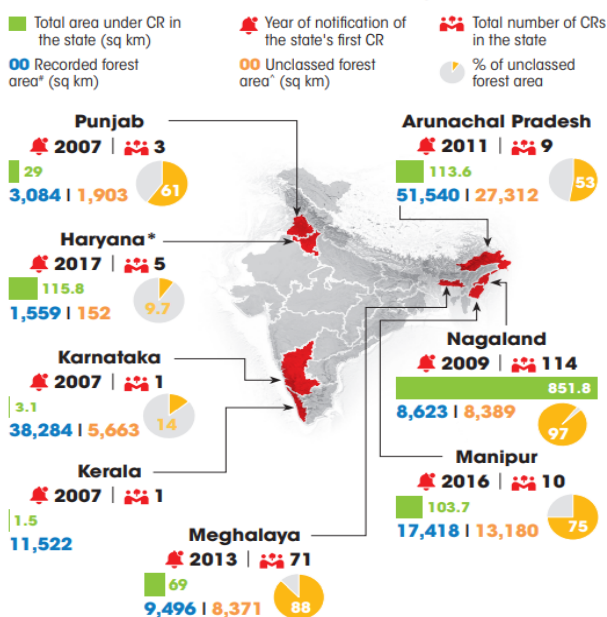


Image: Conservation reserve in different states

Source: DTE

Recent trends:

- Forest areas in many states in India, especially in the Northeast, have been owned and managed **by tribal communities for ages**.
- But, recently the government is gaining control over such forests by signing **memoranda of understanding** with the local self-government. **For instance, autonomous village or district councils in Nagaland and Meghalaya, and Gram Sabhas in Manipur and Arunachal Pradesh, to notify these "unclassified" forests as "community reserve" in lieu of a promise to conserve them and provide livelihood opportunities to the communities.**

- **Joint Forest Management:** Under JFM a bank account is opened with the forest department and village council members as cosignatories. The money in the account is allocated by the Centre in periodic installments on the basis of the conservation and livelihood projects that have already been approved by the Ministry of Environment (MOEFCC) to be undertaken in the community reserve.
 - The activities can be ecotourism activities, such as bird watching or hiking, to generate income for the community.
 - The money is used to help conservation efforts and to aid those who have suffered due to the creation of the community reserve; for instance,
 - Families that have lost cultivable land due to the forest being declared a community reserve.
 - **Joint Forest Management Committee:** Include of four members nominated by the village council and one member nominated by the forest department, is responsible for identifying the beneficiaries to distribute the money,"
- "India State of Forest Report 2021" classifies forests into three categories: **reserved, protected and unclassified**-
 - **Reserved forests** have the maximum protection, with all activities prohibited unless permitted by the forest department.
 - **Protected forests** have limited degree of protection, where all activities are permitted unless prohibited by the forest department
 - **Unclassified forests** are all areas recorded as forest but not included in reserved or protected forest categories. They can be owned by the government, communities, clans or individuals. **This is the category of forests primarily being converted to community reserve.**

Community reserve:

- Once the Centre notifies an area as a community reserve, **WPA, 1972 becomes applicable and, as per Section 33 of the Act, the Chief Wildlife Warden of the state becomes the governing authority of the forest**, whose consent is required for all decisions pertaining to the area.
- After a forest has been made into a community reserve, **people are not allowed to hunt there, or collect non-timber forest produce, or use it for agricultural practices.**

Concerns with these steps of the forest management:

- Though the government's promise to conserve the forest and provide livelihoods ends with the duration of the MOU, but even **when the mou's duration is over, the area remains notified as a community reserve.**
- The biggest flaw in notifying the area as a community reserve is that the status does not revert to the original once the MOU is signed.
- MOU's are signed convincing the people that it will provide them **with livelihood opportunities**. But, Once the community reserve is notified, the forest department takes steps to prevent harmful practices such as cultivation **of any kind, hunting, fishing, and collection of forest produce**. Thus, it deprives people of their access to the forest area.

- Additionally, the local community were of the opinion that **benefits accrued under this project vary from region to region and they are insufficient to meet the requirements** of the people.
- There are many families which had landholding under the conservation area but now they are unable to cultivate their land. They cannot hunt or fell trees, nor can they collect any non-timber forest produce like herbs, fruits and firewood.
- In community reserves notified in Manipur, **people cannot even enter the area without being fined**. They are being treated as trespassers.

Why is this step seen as counterproductive?

- Northeast states already have a **well-established conservation mechanism**, which is proven by its existing forest wealth.
 - **Of India's 13 states that have at least 33 per cent of their geographical area under forests, a Sustainable Development Goal—eight are in the Northeast.**
- Local communities have been **protecting these forests and the biodiversity with their traditional practices for generations** through **Community Conservation Areas (CCA)**
- The village or district councils or gram sabhas designate certain areas as cca for a fixed duration and dissolve them once the conservation status is satisfactory.

Conclusion: The government should let the local people engage in the effort of conserving the forest ecosystem without creating any legal hurdle in front of them. The government should allocate funds and livelihood benefits to **Community Conservation Areas (CCA)**, without the need to convert them to community reserves.

2. Uplifting Nudge

Context: The Haryana government amended the Haryana Panchayati Raj Act to ensure that 50 % of seats are reserved for women along with mandatory education for all candidates. These legislations are producing a positive impact on the backward regions of the state.

Positive impact:

- The Haryana Panchayati Raj Act, 1994 was amended in 2015 to make it mandatory for **election candidates to have a basic education**.
- As per the amendment, general candidates must have completed class 10, while women and Dalit candidates must have completed class 8, and Dalit women must have completed class 5.
- The second amendment, which was passed in 2020, reserved 50% of the seats for women and 8% for the “more disadvantaged” members of the Backward Classes.
- Both of these initiatives have resulted in a significant increase in women's participation in panchayat functioning.
- In the Nuh district, which is dominated by backward classes, **2,140 women ran for panchayat seats, accounting for 45.6 per cent of all candidates**; 754 women ran for Sarpanch, accounting for 44.8 per cent of 1,680 candidates.

- As education has become mandatory for voting, attitudes have shifted, and **more girls are receiving education**. Families are also **emphasizing education while fixing marriages**.
 - 90 % of marriages in the district are fixed on the condition that the bride will be educated even after the marriage.
- **Dowry demand has also decreased** as awareness has grown, and **women have become more vocal about domestic violence**.
- These findings are encouraging because Haryana has one of the lowest sex ratios in the country: 833 girls for 1,000 boys at birth in 2011, and the literacy rates for men and women in rural areas were 81.55 per cent and 51.96 per cent, respectively.

Negative impact:

- According to various Non-governmental organisations, **these laws have prevented 67% of Dalit women candidates from contesting the elections**.
- Despite the fact that more girls are enrolling, **more than half of the teaching positions are vacant**, putting the **quality of education at risk**. To contest elections, **fake certificates are even produced from other states**.
- The practice of the Sarpanch Pati system is still continuing, with women candidates running as proxy candidates for their male family members. Even in panchayats, women are hesitant to speak in front of the community's elders, exacerbating the problem.

3. Why GM Mustard?

Context: Recently, the Union Ministry of Environment, Forest and Climate Change's Genetic Engineering Appraisal Committee (GEAC) approved the manufacturing of genetically modified (GM) mustard seeds before they were released for commercial use.



Source: CSE

What is GM-Mustard?

- Dhara Mustard Hybrid (DMH-11) is a transgenic mustard that was created indigenous. It is a Herbicide Tolerant (HT) mustard variety that has undergone genetic modification.
- It has two alien genes—“**barnase**” and “**barstar**”—that have been identified from the **Bacillus amyloliquefaciens soil bacterium** and enable the production of commercial mustard hybrids with excellent yields.
- It was created by **Delhi University's Center for Genetic Manipulation of Crop Plants (CGMCP)**.
- The GEAC recommended that the HT Mustard crop be given commercial approval in 2017. The Supreme Court, however, ordered the central government to consult the public before releasing it.

What is the significance of the recent clearance?

- The genetically modified (GM) mustard, known as **Dhara Mustard Hybrid (DMH-11)**, can now be **cultivated in open fields for experiments, demonstrations, and for seed—a step before the country's first GM food crop** is approved for commercial cultivation.
- Within a week of the **Genetic Engineering Appraisal Committee (GEAC)**, India's top regulatory body for **transgenic products**, deciding to start the field testing of the crop, the government approved the GM mustard.

Need for GM-Mustard:

- **Essential:** It is essential, according to the government and the scientists pushing for DMH-11, to make India self-sufficient in edible oils. "The country has a shortfall of between 55% and 60% of edible oil.
- **Import of oil:** India imported 13.35 million tonnes of oils in 2021 to meet demand, costing the nation's exchequer ₹117,000 crore.
- **Demand increase:** India will require 34 million tonnes of edible oils by 2025–2026 at the present consumption rate, placing a considerable strain on the nation's foreign exchange reserves.
 - Given that mustard accounts for 40% of all edible oil output in India, scientists believe GM mustard has the power to change the situation.
- **Other oil crops:** The other two main oilseed crops, soybean and groundnut, account for 18% and 15%, respectively, of the overall output of edible oils.
- **Cultivation:** Currently, 8 million hectares of land are used to grow mustard, with an average yield of 1.1 to 1.3 tonnes per hectare.
 - It believed the transgenic seeds may be able to increase yields to 3-3.5 tonnes per acre.
 - They also considerably increase productivity while lowering farm input costs since they are resistant to pests that spread the disease white rust, which is a typical disease of mustard.

Development of GM-Mustard:

- **Conventional method:** A transgenic variety was required, according to propagators of DMH-11, because it is difficult to create high-yielding, pest-resistant mustard types by conventional cross-breeding techniques.
 - With both the **male (anther) and female (pistil)** reproductive organs present in the same flower, the plant primarily self-pollinates.
 - In order to promote cross-pollination, breeders make one of the parents' males sterile in order to produce a hybrid child with the desired qualities. This takes a lot of time as well.
 - However, genetic manipulation enables researchers to circumvent these issues and directly alter a plant's genetic makeup to produce the desired attribute, such as making it resistant to a specific pest.
- **New method:** DMH-11 was developed by a group of scientists at the Centre for Genetic Manipulation of Crop Plants, University of Delhi, utilizing both hybrid and transgenic techniques.
 - The aim was to **cross the fast-growing, high-biomass Early Heera-2** variety from **Eastern Europe with the high-yielding Indian variety Varuna**.

- They achieved this by using a genetic engineering process created by Belgian researchers in the 1990s, which involved first inducing male sterility in one of the parental lines and then restoring fertility in the progeny.
- From the soil bacterium *Bacillus amyloliquefaciens*, two genes—**barstar** and **barnase**—were selected and introduced into the mustard plant's DNA.
- Barnase specifically breaks down the cell layer around the pollen sac inside the anther, stopping pollen production and causing male sterility.
- Barstar then promotes fertility by reducing barnase activity in the progeny. Researchers employed another gene from the bacteria *Streptomyces hygroscopicus* called **bar**.

- **Pesticide resistance: The bar gene confers resistance to the pesticide glufosinate ammonium**, which controls weed growth.

- Some people are concerned about the potential hazards associated with the introduction of foreign genetic elements into plant crops.

4. Next step net Zero

Context: Indian Railways is attempting to reduce its carbon footprint gradually and aims to become a Net Zero Carbon Emitter by 2030. The Railways will take steps to reduce its carbon footprint by sourcing its energy needs from renewable sources.

About Net Zero Carbon Emission of Indian Railway

- Indian Railway is the **fourth largest rail network in the world**. The Indian transport sector accounts for 12% of total greenhouse gas emissions, with the **railway industry accounting for 4%**.
- **Railway is attempting to achieve net zero carbon emission by cutting down the emissions** rather than focusing on carbon offsetting,
 - Carbon offsetting involves compensating for emissions through green activities such as reforestation or land restoration drives.
- The Railways intends to achieve this ambitious goal in two stages.
 - **Complete transition to electric locomotives by December 2023.**
 - **Trains and stations to be powered primarily by nonrenewable sources by 2023.**
- Achieving the set target could help India meet its Nationally Determined Contribution of reducing its carbon emissions by 33 per cent by 2030, as transport is a key sector with substantial mitigation potential.

What is Net Zero Emission?

- Net zero emission refers to **reducing greenhouse gas emissions to as close to zero as possible**.

Current status of Green Railway Initiative:

- According to the Union Ministry of Railways' Mission 100% Electrification: Moving towards Net Zero Carbon Emission report, the **Railways' annual diesel consumption has decreased** from 3,066 million liters in 2018-19 to 1,092 million liters in 2020-21.
- The average speed of trains along the electrified routes has been increased due to increased throughput.

- As of July 2022, the **total share of diesel coaches for freight movement stood at 18.74 per cent and 21.7 per cent for passenger trains**. Only about 20% of the railway's broad gauge tracks are still not electrified.
- According to estimates, Railway energy consumption is expected to triple to 72 billion units by 2029-30. **A shift to renewable energy sources by 2030 will help offset 60 million tonnes of CO₂ emissions** when compared to non-renewable sources.

Methods used by Railway:

- Railways are implementing novel solutions, such as **investing in battery projects to ensure continuous renewable supply and installing solar panels along railway tracks, on top of trains, stations, and administrative buildings for sustained electricity generation**.
 - Over 1,000 stations and buildings had installed solar panels with a total capacity of 111 MW by January 2021.

GREEN ALL THE WAY

Solutions that the Railways plans to embrace to increase its installed capacity of renewables to 30 GW by 2030

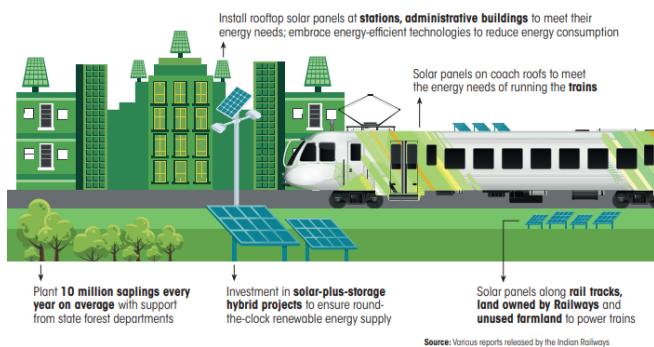


Image: Net-zero carbon emission project of Railway
Source: Down to Earth

- Railways have the **potential to generate 20GW of solar power** by establishing land-based solar plants on unused land.
- A **solar-plus-storage hybrid pilot project** is being established in Dahod, Gujarat to ensure round-the-clock supply to the traction network.
- **700 railway stations across the country have been certified as ISO 14001 compliant**, which addresses effective environmental management systems. **Green certifications have been obtained for 31 railway buildings and 32 railway stations**.
- **Afforestation drives** are being conducted on vacant railway land and in between sections of railway tracks.
 - Since 2017, Railways on average planted 10 million saplings a year along with state forest departments.

Hurdles in achieving the target:

- Railways will need to **install 30,000 MW of renewable energy capacity** due to **regional variations in solar and wind energy availability**.
 - At present, the installed renewable energy capacity of the Indian Railways is only 245 MW.
- Because of current power purchase agreements with coal plants, **8.5 % of total energy demand will still have to be met by nonrenewable sources**.

5. Burp control

Context: Scientists from Central Institute for Research on Buffaloes Haryana recently developed a feed supplement that can reduce Methane (CH₄) gas belched out by stock animals such as cattle, goats, and sheep.

About Methane produced by livestock:

- According to estimates, livestock is responsible for up to **14% of all human-induced greenhouse gas emissions**.
- **Methane is largely belched out by ruminants**, primarily sheep and cattle, and **accounts for more than one-third of total agricultural emissions**. A typical ruminant produces 250-500 litres of methane per day.
- Globally, livestock release the **methane equivalent of 3.1 gigatonnes of carbon dioxide into the atmosphere each year** by burping (and a minor amount through farting).

Methane

- Methane is the **second most abundant greenhouse gas after carbon dioxide (CO₂)**. Methane has a **30 times greater global warming potential than CO₂**, but it is **shorter-lived and only lasts about 12 years in the atmosphere**.
- Reducing methane emissions is one of the most immediate opportunities to slow global heating.
- The **Global Methane Pledge**, signed in 2021 by more than 100 nations, **calls for taking voluntary measures to cut global methane emissions by 30% from 2020 levels by the end of the decade. By 2050, this might prevent warming of more than 0.2°C**.

How methane is produced by ruminants?

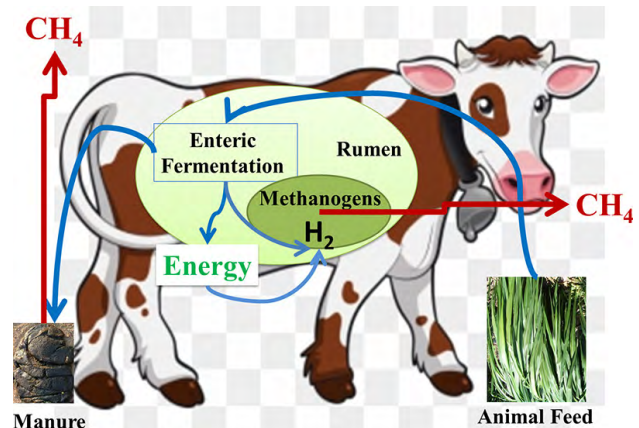


Image: Methane produced in Cow
Source: www.sciencedirect.com

- Ruminants, unlike other animals, have **specialized digestive systems that include stomachs with four compartments rather than one**.
 - Plant material is initially transported to the rumen, the stomach's largest compartment inhabited by microorganisms such as fungi, bacteria, protozoa, and archaea.
 - These microorganisms break down the otherwise indigestible cellulose-rich plants releasing protein and energy in exchange for nutrition and shelter.

- However, during this process, **enteric fermentation**, the **archaea combine CO₂ and hydrogen** made by the cellulose-digesting microbes **to produce methane**.
- Scientists believe that **controlling the archaeal population and eating a diet high in roughage** can help **reduce the methane released** by ruminants.

Scientific advancement in this field:

- Scientists from the Central Institute for Buffalo Research **developed a supplement that reduced the archeal population** in the rumen while increasing the growth of bacteria that digest feed.
- Ingredients in the supplement include **Indian cherry and Indian elm leaves, garlic oil, mustard oil, cottonseed oil, sodium nitrate, and magnesium sulfate**.
- According to lab results, this could reduce methane emissions by 44.6% in lactating animals and 75% in calves.
- If a food supplement can reduce methane emissions by at least 20% It is considered to be ideal.

Developments in other countries:

- **Bovaer developed by Dutch bioscience company Royal DSM:**
 - The European Union has approved a **feed supplement, Bovaer**, which claims to consistently **reduce methane emissions from dairy cows by 30-80 %**.
 - Bovaer is a fine granular powder that contains **3-nitrooxypropanol**, which inhibits an enzyme that is required for methane production.
- **Seaweed:**
 - According to a study led by an associate professor at the University of California, **Asparagopsis taxiformis, a red alga found in tropical and subtropical waters**, has **reduced methane production by 95%**.
 - The seaweed inhibited the activities of microbes in the rumen thereby reducing methane emission.
 - On the negative side, two chemicals that inhibit the release of greenhouse gasses, **bromoform and bromochloromethane, are carcinogenic**. These chemicals were found in the milk and urine of cows fed seaweed.

Conclusion: These studies are in their early stages, and the current understanding of rumen microbes is limited. There are concerns that microbes will develop resistance to the supplement. There is still much work to be done before it can be made public.

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