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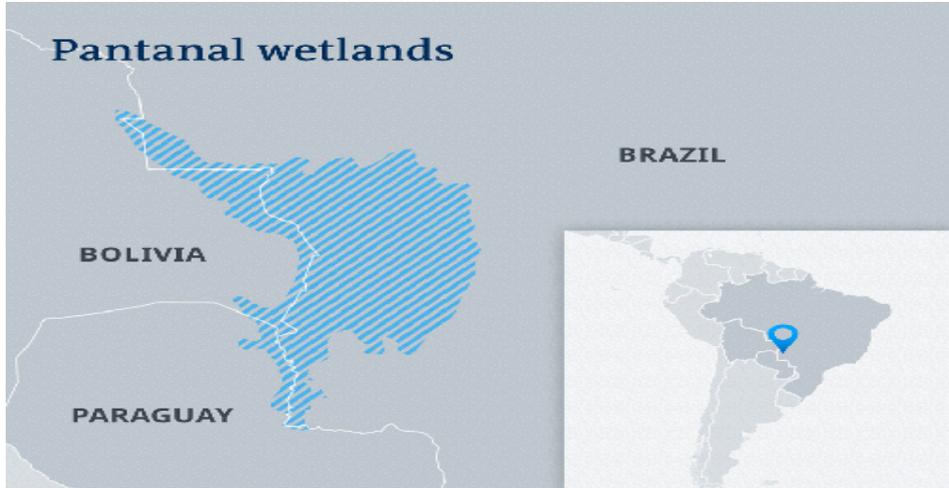
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Geography

1. Places in News part - IV

Pantanal Wetlands



- Pantanal, the world's largest tropical wetlands is facing a severe crisis due to wildfires and climate change.
- It is a natural region encompassing the **world's largest tropical wetland area, and the world's largest flooded grasslands.**
- Roughly 80% of the Pantanal floodplains are submerged during the rainy seasons, nurturing a biologically diverse collection of aquatic plants and helping to support a dense array of animal species.
- **Vegetation in the Pantanal has evolved to coexist with fire – many plant species there require the heat from fires to germinate.**
- Often caused by **lightning strikes**, those natural fires spring up at the end of the dry season, but the surrounding floodplains prevent them from spreading.



What's different now is the drought, contributing further to the unusually dry conditions and exacerbating the fire risk.



Pandav Leni Complex

- Archaeological Survey of India (ASI) has found **three more caves** in the Trirashmi Buddhist cave complex, also known as **Pandav Leni**, near **Nashik, Maharashtra**.
- The Buddhist sculptures and caves (in Nashik) are a significant **early example of Indian rock-cut architecture** representing the **Hinayana tradition of Buddhism**.
- The caves have images of the **Buddha and Bodhisattvas**, and sculptures with designs of **Indo-Greek architecture**.
- **Most of the caves are viharas** except for **Cave 18** which is a **chaitya** of the 1st century BCE.
- Other caves in the area are **Karla Caves, Bhaja Caves, Patan Cave and Bedse Caves**.



Leang Sakapao Caves- Indonesia

- Archaeologists have discovered the **world's oldest known cave art** – a life-sized picture of a wild pig that was painted at least 45,500 years ago in Indonesia - weathering at an alarming rate.
- The artwork made with pigments was decaying due to a process known as **haloclasty**, which is triggered by the growth of salt crystals due to repeated changes in temperature and humidity.
- This is caused by alternating wet and dry weather in the region.
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Geography

Internal Displacement in Burundi

What is the News ?



Content of the Lecture

- Migration - NCERT
- Prelims - Map Based Pointers
- Points for Mains + Application
- Question of the Day - Prelims

Migration - NCERT

- Reasons for Migration
 - ✓ **Push Factor** - these cause people to leave their place of residence or origin.
 - ✓ **Pull Factors** - which attract the people from different places.

Prelims - Map Based Pointers

Burundi





Great Lakes of Africa



Imp Points for Prelims

- Lake Tanganyika - the **world's second-largest freshwater lake by volume and depth**
- Lake Victoria - **second-largest fresh water lake in the world by area**

Points for Mains + Application

- Climate shocks, mainly the rapid and significant rise of Lake Tanganyika, caused at least 84 per cent internal migration in East Africa's Burundi in the recent years, according to Save the Children, a global independent organisation for children.
- During the past two years, persistent heavy rain, followed by floods, landslides and strong winds, raised Lake Tanganyika to dangerous levels.
- **Lack of funds** has direct consequences on the planned assistance.
- **It has also negatively impacted living conditions of the most vulnerable populations**, according to the United Nations Office for the Coordination of Humanitarian Affairs
- **Save the Children called on the international community to urgently fund Burundi's humanitarian crisis**, with focus on ensuring child- centred investments and helping poorer countries manage unavoidable impacts.
- Climate Change
- Climate Migrants
- Internal Migration
- Disaster Management
- Role of NGO's
- Essay

Question of the Day

Identify the Laurentian Great Lakes among the following :

1. Lake Huron
 2. Lake Superior
 3. Lake Eyre
 4. Lake Ontario
- A. 1 and 2 only
B. 2 and 3 only
C. 1,2 and 3 only
D. 1 ,2 and 4 only

Geography

What is the News ?

Climate Crisis in North East India

Why are rainfall patterns changing?

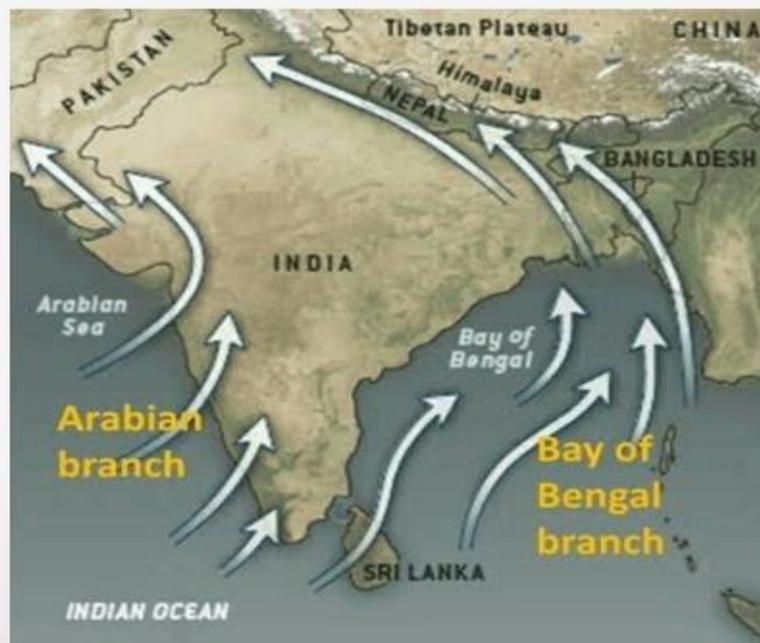
Content of the Lecture

- North Eastern rainfall-Changing Pattern. (Points for Mains)
- Additional Concept to be Learnt.
- Question of the Day.

Context

- The North East India, which normally receives heavy rainfall during the monsoon months (June-September), has changed character for the worse.
- The climate of North East India is changing: Rainfall patterns over the region in the last century have considerably changed, resulting in its overall drying up.

Rainfall in North East



- The North East India, which normally receives heavy rainfall during the monsoon months (June-September), has changed character for the worse.
- The climate of North East India is changing: Rainfall patterns over the region in the last century have considerably changed, resulting in its overall drying up.



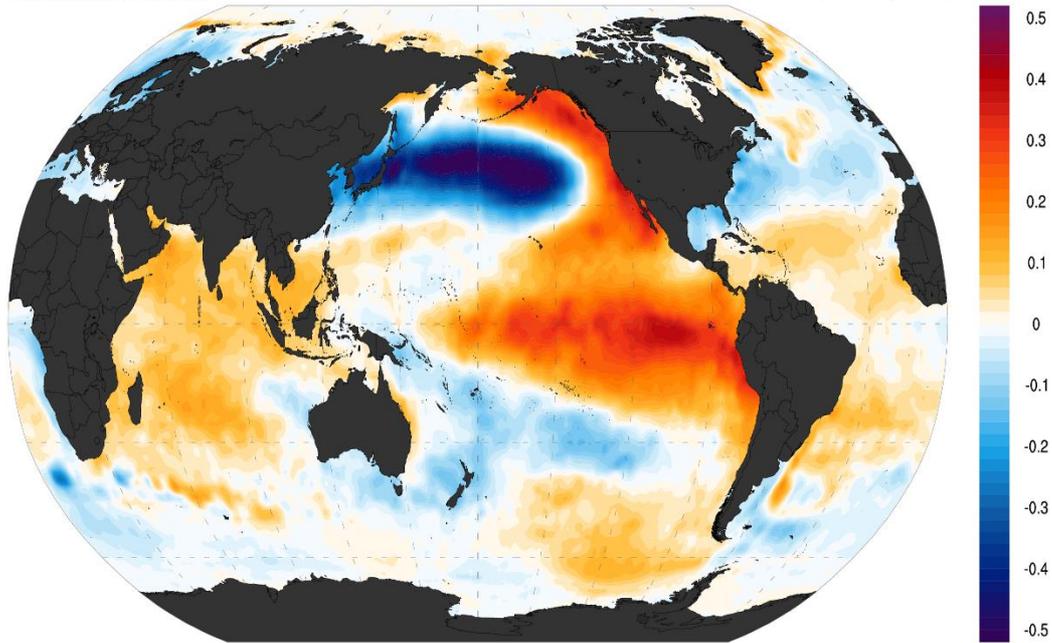
- TAILOR MADE POINTS FOR MAINS
- DIFFERENT STUDIES

What are rainfall patterns in the region changing?

- An aspect of warming that influences rainfall is drying of the land, which increases the frequency and intensity of dry periods and droughts.
- An increase in moisture and the drying up together change the rainfall patterns in unpredictable ways.
- Other climatic factors such as the increased snowfall in the Eurasian region also impact monsoon rainfall in North East India.
- Excessive snowfall in Eurasia causes cooling of the atmosphere of region, which triggers events eventually leading to a weak summer monsoon season there.
- Rainfall patterns in North East India differed significantly from one sunspot epoch to another.
- Sunspot epochs are alternating periods of increased and decreased activity on the sun's surface that influence the climate of earth.
- A Journal of Climate research paper from 2016 also found that PDO is being influenced by global warming as it decreases the difference of temperatures among the layers of the ocean. It said the peak of PDO will change from 20 to 12 years, which may have an impact on the monsoon rainfall in the North East India.

Pacific Decadal Oscillation

Temperature ($^{\circ}\text{C sd}^{-1}$)



- A Journal of Climate research paper from 2016 also found that PDO is being influenced by global warming as it decreases the difference of temperatures among the layers of the ocean. It said the peak of PDO will change from 20 to 12 years, which may have an impact on the monsoon rainfall in the North East India.

Issues

- lack of data and credible long-term research on the same. This is because there is no data collection infrastructure. The data that is collected is not of high quality, which means that no fool-proof analysis can be carried out.
- “Rainfall forecasts for the North East are almost always wrong – **Experts**”

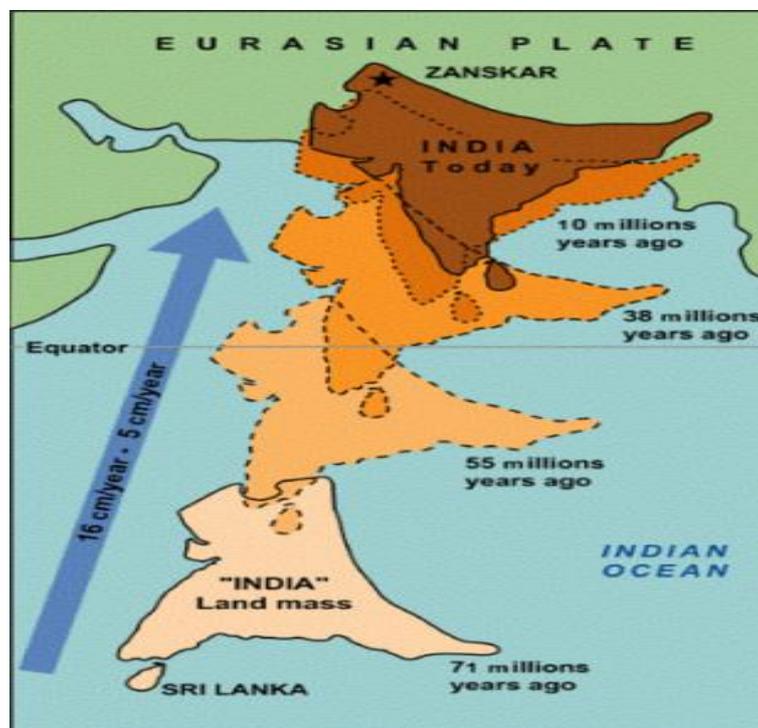
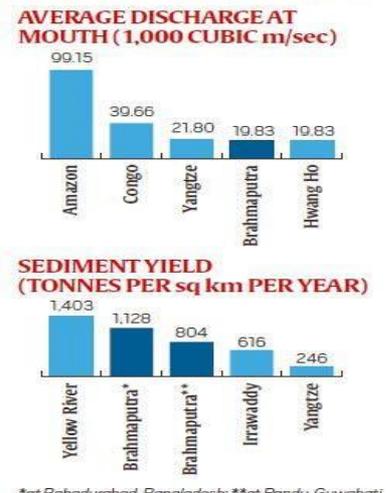
Impact

- This changing rainfall pattern, especially during the monsoon season, affects the flow of rivers, extent of snow cover and health of mountain springs, which in turn have an impact on livelihoods, especially agriculture and fishing, forest flora growth, animal and bird habitat (and behaviour) and other ecosystem aspects.
- Because of its unique topology and steep slopes suddenly giving way to plains, the region is prone to river course changing.
- But now, the frequency of these changes is increasing because of heavy rainfall and other factors.

AREA OF INFLUENCE



STRONGEST & SILTIEST



- Because of its unique topology and steep slopes suddenly giving way to plains, the region is prone to river course changing.
- But now, the frequency of these changes is increasing because of heavy rainfall and other factors.

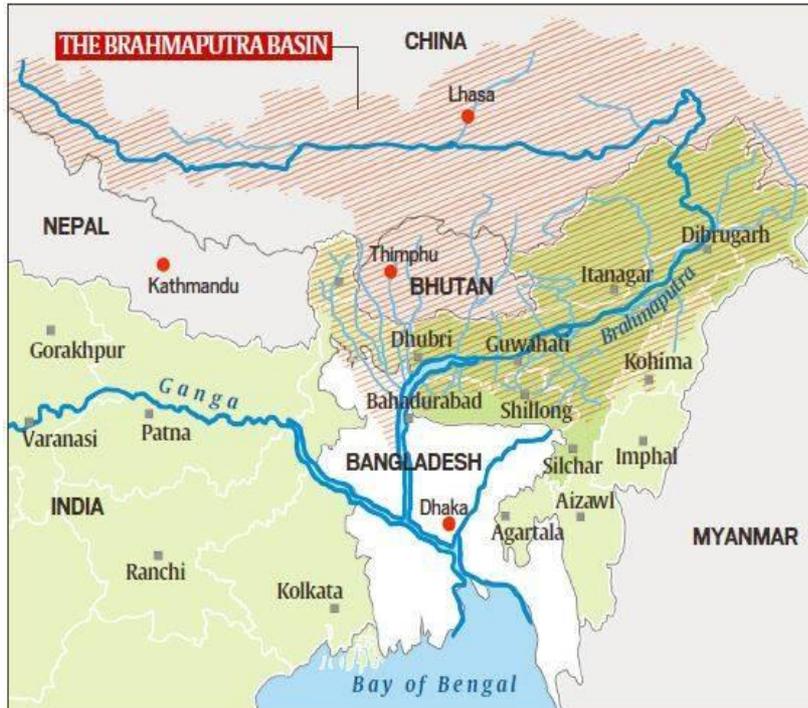
Application in Mains

- Climate Change
- Indian Monsoon
- Disaster Management
- North East Development
- Essay

Additional Points to be Learnt

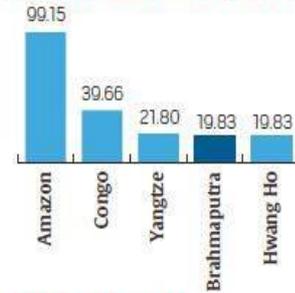
Why is Assam Prone to floods?

AREA OF INFLUENCE

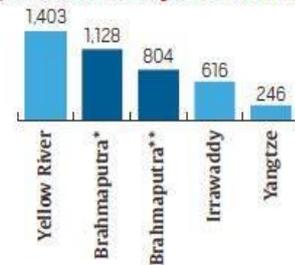


STRONGEST & SILTIEST

AVERAGE DISCHARGE AT MOUTH (1,000 CUBIC m/sec)



SEDIMENT YIELD (TONNES PER sq km PER YEAR)



*at Bahadurabad, Bangladesh; **at Pandu, Guwahati

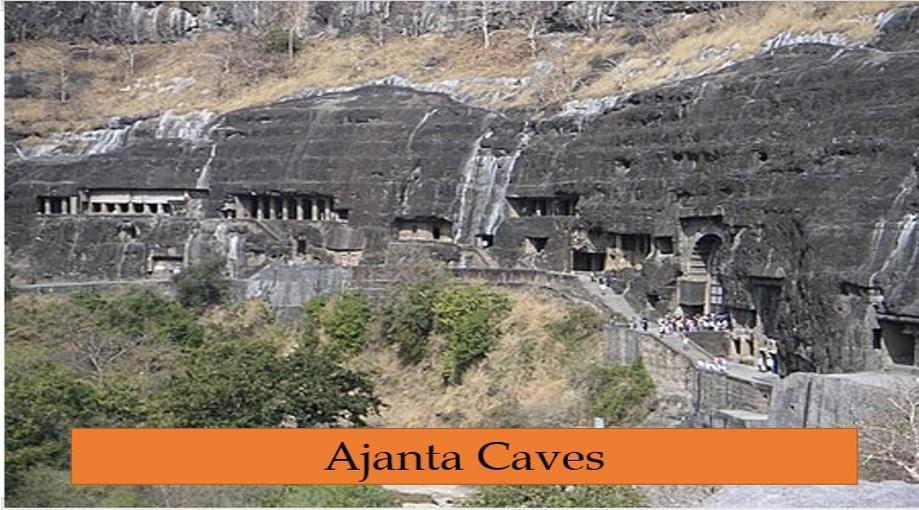
Question of the Day

Arrange the hills from North to South :

- 1) Mishmi Hills
- 2) Mikir Hills
- 3) Mizo Hills

History

Ajanta Caves



Discovery

- They were covered by jungle until accidentally "discovered" and brought to Western attention in **1819** by a colonial British officer **Captain John Smith** on a tiger-hunting party.

Geography

- The caves are in the rocky northern wall of the **U-shaped gorge of the river Waghur**, in the Deccan plateau.

Location

- **Aurangabad District, Maharashtra. (Sahyadri Range - Western Ghats).**

Prominent Religion reflected

- **Buddhism.**

Time Period

- **2nd century BCE to about 650 CE.**
- **Approx. 29 rock cut Buddhist cave Monasteries. (25 - Viharas and 4 Chaityas)**
- They were built in 2 phases -
 - **Phase I - 2nd cen BCE.**
 - **Phase II - 400 CE till 650 CE.**

Important Designation

- UNESCO World Heritage Site (1983) and Protected Monument under care of ASI.

What all is depicted in these caves ?

- **Ancient monasteries and worship-halls** of different Buddhist traditions carved into a 75-metre (246 ft) wall of rock.
- The caves also present **paintings** depicting the past lives.
 - Rebirths of the Buddha, pictorial tales from Aryasura's Jatakamala, and rock-cut sculptures of Buddhist deities.

Important Point

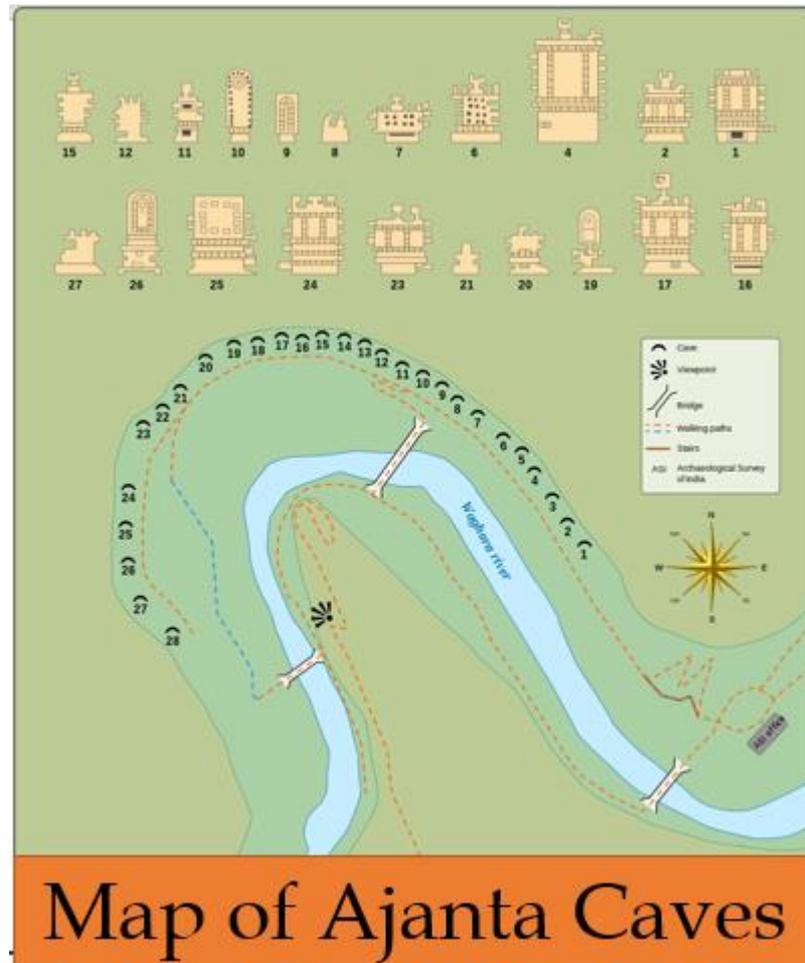
- Caves 16, 17, 1 and 2 of Ajanta form the **largest corpus of surviving ancient Indian wall-painting**.
- Mixture of Chaityas - Viharas and Stupas.

Purpose ?

- Textual records suggest that these **caves served as a monsoon retreat for monks**, as well as a resting site for merchants and pilgrims in ancient India.
- Numbering of Caves is just for reference and **does not reflect the chronological order of their constructions**.

References in other Important Texts

- Travel accounts of **Chinese Buddhist travellers Fa Hien** (during the reign of Chandragupta II; 380- 415 CE) and **Hieun Tsang** (during the reign of emperor Harshavardhana; 606 - 647 CE). .
- The Ajanta caves are mentioned in the **17th-century text Ain-i-Akbari by Abu al-Fazl**, as twenty four rock-cut cave temples each with remarkable idols.



Caves of the first Period

- **Earliest Caves**
 - Consists of caves 9, 10, 12, 13 and 15 A.
- **Time Period -**
 - Roughly around 100 BCE to 100 CE.
- **Patronage -**
 - **Satvahana Dynasty**
 - The first Satavahana period caves **lacked figurative sculpture**, emphasising the stupa instead.

Caves of the Second Period

- **Time Period -**
 - Around 5th century (4th till 7th CE).

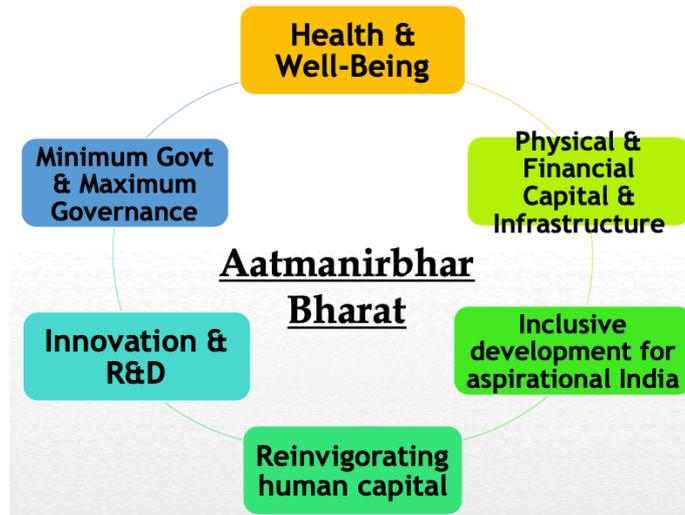
- **Patronage**
 - **Vakataka Dynasty (Emperor Harisena).**
 - The second phase is attributed to the **theistic Mahāyāna, or Greater Vehicle tradition of Buddhism.**
- Important Point - Ajanta Caves encompass both Theravada (Hinayana) and Mahayana Buddhist traditions.
- The paintings are in "**dry fresco**", painted on top of a dry plaster surface rather than into wet plaster.
 - One of the striking features is the **absence of blue colour.**
- Cave No. 8 - Oldest of the monasteries.
- Cave No. 9 - Oldest Chaityas.



The "Hope" Experiment

Polity

1. 5 Important Schemes in Budget 2021



Name:	PM Aatma Nirbhar Swasth Bharat Yojana
Ministry:	Health and Family Welfare- Centrally Sponsored Scheme
Focus of the Act:	This scheme will in addition to the <u>National Health Mission</u> . National Health Policy (NHP), 2017 envisages <u>raising public health expenditure from the existing 1.15% to 2.5% of GDP by 2025 in a time bound manner</u> . The measures under the scheme focus on developing capacities of health systems and institutions including NCDC across the continuum of care at all levels viz. primary, secondary and tertiary and on preparing health systems in responding effectively to the current and future pandemics/disasters.
Other details:	The PMASBY targets to <u>build an IT enabled disease surveillance system</u> by developing a network of surveillance laboratories at block, district, regional and national levels, in Metropolitan areas & <u>strengthening health units at the Points of Entry</u> , for effectively detecting, investigating, preventing and combating Public Health Emergencies and Disease Outbreaks. It also envisages up of a <u>national institution for One Health</u> , a Regional Research Platform for WHO South East Asia Region.

Name:	Jal Jeevan Mission (Urban)
Ministry and Type:	Housing and Urban Affairs- Centrally Sponsored Scheme
Focus of the Act:	<p>This scheme seeks to provide universal coverage of water supply to all households through functional taps in all statutory towns in accordance with Sustainable Development Goal- 6.</p> <p>It complements the Jal Jeevan Mission (Rural) which envisages supply of 55 litres of water per person per day to every rural household through Functional Household Tap Connections (FHTC) by 2024.</p>
Other details:	<p>Key areas of Mission:</p> <ul style="list-style-type: none"> • Rejuvenation of water bodies to augment sustainable fresh water supply; • Creating green spaces and sponge cities through an Urban Aquifer Management plan; • Promote circular economy of water; • Pey Jal Survekshan will be conducted in cities; <p>Major reforms are reducing non-revenue water to below 20%; recycle of treated used water to meet at least 20% of total city water demand and 40% for industrial water demand at State level.</p>

Name:	SWAMITVA (Survey of Villages and Mapping with Improved Technology in Village Areas) Yojana
Ministry and Type:	Panchayati Raj- Central Sector Scheme
Focus of the Act:	<p>It was launched nation wide on National Panchayati Raj Day, 24th April 2021 after successful completion of pilot phase of scheme (2020-2021) in 9 states. It is a reformative step towards establishment of <u>clear ownership of property in rural inhabited (Abadi) areas</u>, by mapping of land parcels using drone technology and providing 'Record of Rights' to village household owners with issuance of <u>legal ownership cards (Property cards/Title deeds) to the property owners.</u></p>
Other details:	<p>The scheme seeks to achieve the following objectives: -</p> <p>Creation of accurate land records for rural planning and reduce property related disputes by establishment of of <u>Continuous Operating Reference System</u> which will help with geo-referencing.</p> <p>To bring financial stability to the citizens in rural India by enabling them to use their property as a financial asset for taking loans and other financial benefits.</p> <p>Determination of property tax.</p> <p>Creation of survey infrastructure and support in preparation of better-quality <u>Gram Panchayat Development Plan (GPDP)</u> by making use of GIS maps.</p>

Name:	POSHAN 2.0
Ministry and Type:	Women and Child Development- Centrally Sponsored Scheme
Focus of the Act:	The government merged the Supplementary Nutrition Programme and Poshan Abhiyan to launch <u>Mission POSHAN 2.0</u> . It brings together the Integrated Child Development Services (ICDS)—Anganwadi Services, Supplementary Nutrition Programme, Poshan Abhiyaan, Scheme for Adolescent Girls and National Crèche Scheme.
Other details:	It seeks to fulfil SDG 2 by strengthening nutritional content, delivery, outreach and outcome, with renewed focus on developing practices that nurture health, wellness and immunity to disease and malnutrition in the country. September is celebrated as POSHAN MAAH with special attention on Severe Acute Malnourished (SAM) children. It urged all Aspirational Districts to establish a Poshan Vatika (nutrition garden) at anganwadis, school premises and gram panchayats during the Nutrition Month (Poshan Mah) from 1st September.

Name:	Mission Karmayogi- National Programme for Civil Services Capacity Building ('NPCSCB')
Ministry and Type:	Personnel, Public Grievances & Pensions- Partly funded by multilateral assistance to the tune of USD 50 million
Focus of the Act:	It has been launched with the objective of enhancing governance through Civil Service Capacity Building with the following six pillars:- <ol style="list-style-type: none"> i. Policy Framework, ii. Institutional Framework, iii. Competency Framework, iv. Digital Learning Framework (Integrated Government Online Training Karmayogi Platform (iGOT-Karmayogi), v. electronic Human Resource Management System (e-HRMS), and vi. Monitoring and Evaluation Framework.
Other details:	<u>Prime Minister's Public Human Resource Council (PMHRC)</u> : Headed by PM for providing strategic direction to civil service reforms and capacity building. <u>Cabinet Secretariat</u> Coordination Unit: It will monitor the implementation of NPCSCB, align stakeholders and provide mechanism for overseeing capacity building plans. <u>Capacity Building Commission</u> - It will be set up for functional supervision of training institutions and preparation of annual capacity building plans. <u>Special Purpose Vehicle</u> under Section 8 of the Companies Act, 2013 - will own and operate all the digital assets created for NPCSCB on behalf of the Government of India.

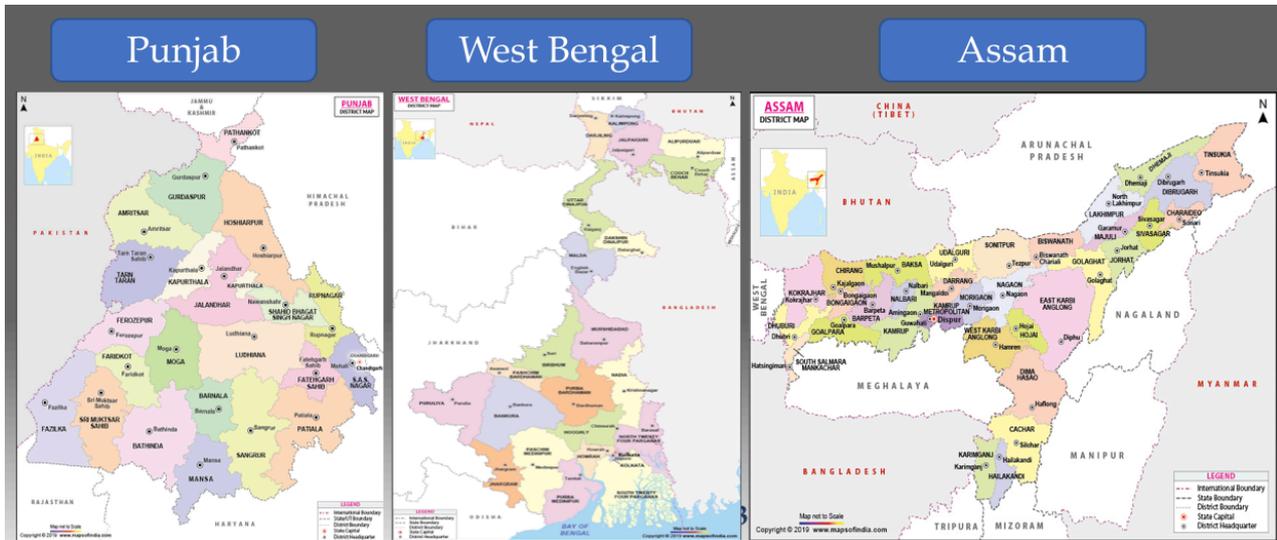
- Keep a Calm and Cool Mind!
- Revise all you have prepared.
- Relax for a day!
- Best of Luck!

Polity & Governance

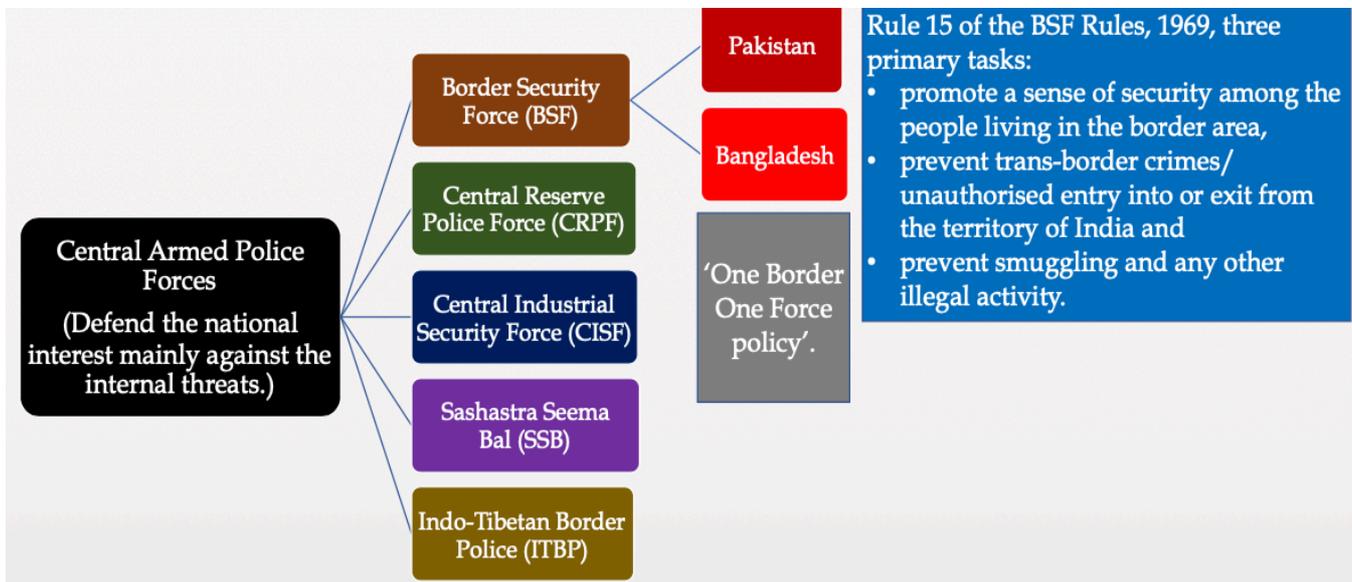
1. Expansion of BSF Jurisdiction and Impact of Federalism

Why is news?

- The **Ministry of Home Affairs** in October 2021 extended the jurisdiction of the **Border Security Force (BSF)** upto 50 kms inside international borders in three states:

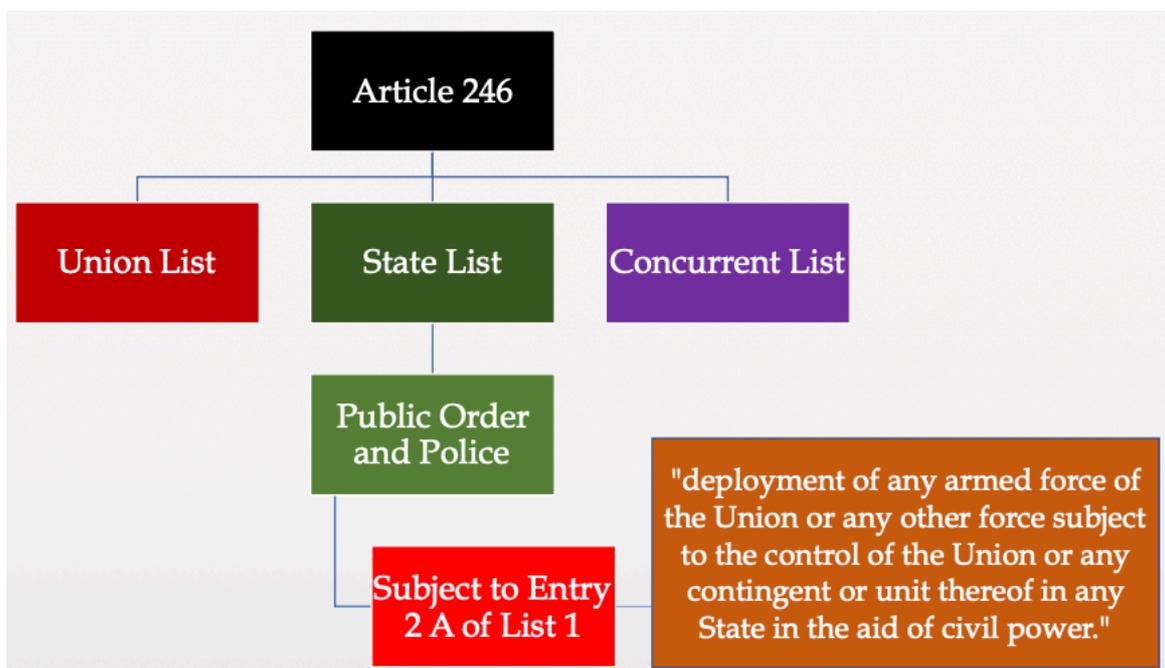


Role and powers of BSF



- Border Security Force's power, duties and jurisdictional limitations are provided under **Border Security Force Act, 1968. S.139(1) of the BSF Act** gives the Central Government and consequently the Ministry of Home Affairs the power to define BSF's jurisdictional limitation.
- BSF's jurisdiction extends to the 10 States and 2 Union Territories which share a boundary with either Pakistan or Bangladesh- i.e Manipur, Mizoram, Tripura, Nagaland and Meghalaya, Gujarat, Rajasthan, Punjab, West Bengal and Assam and UTs of Jammu and Kashmir and Ladakh.
- 2021 Notification amends 2014 notification
 - ✓ Extends powers of the BSF which include arrest, search and seizure-from 15km to up to 50 km inside the international borders in Punjab, West Bengal and Assam.
 - ✓ The jurisdictional limit with respect to the state of Gujarat has been reduced from 80kms to 50 kms.

Issues in federalism



Need?

- Sources said the objective of the move is to bring in uniformity and also to increase operational efficiency.
- It is to complement the efforts of the local police. It is an enabling provision.
- It hopes to increase coordination and often local police often have poor understanding of the BSF jurisdiction

Tilt towards the Central Government

- The Central Government in exercise of the powers conferred by S.139 (1) of the Border Security Force Act, 1968 can notify the area and extent of BSF's operational mandate from time to time.
- Central Government has the power to **unilaterally increase or decrease the jurisdictional limits** of the BSF in these areas without the concurrence of the states.
- There is **no statutory mandate** of either consultation or concurrence of the state governments in case the powers enhanced are under Central Acts, such as Passport (Entry to India) Act, Registration of Foreigners Act, Central Excises and Sale Act, Foreigners Act, FEMA, Customs Act etc.
- The BSF Act mandates the concurrence of the state in question **only when the powers or duties being conferred are under a State Act.**
- The BSF does not have police powers; after apprehending a suspect it can **only conduct "preliminary questioning"** and has to hand over a seized consignment or the suspect to the local police within 24 hours. It **does not have powers to prosecute crime suspects.**
- Its jurisdiction has been **extended only in respect of the powers it enjoys under Criminal Procedure Code (CrPC), Passport (Entry into India) Act, 1920 and the Passport Act, 1967.**
- Further, the Central Government's powers are **circumscribed by following conditions:**
 - ✓ It must be with respect to states adjoining the borders of India.
 - ✓ State's concurrence is required if powers enhanced are with respect to State Laws.
 - ✓ The notification/order is placed before the Parliament and passed by both houses.
 - ✓ The observation of the Supreme Court of India (Naga People's Movement of Human Rights vs Union of India) that Union forces must not result in supplanting or substituting the civil power in the State.

Polity

Importance of Ayushman Bharat Health Infrastructure Mission?

Political Science and International Relations

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6 th November 2021	Indian Government and Politics	Sectional 2
13 th November 2021	Comparative Politics and International Relations	Sectional 3
20 th November 2021	India's Foreign Policy	Sectional 4
27 th November 2021	Paper 1 Full Syllabus	FLT 1
4 th December 2021	Paper 2 Full Syllabus	FLT 2
11 th December 2021	Paper 1 Full Syllabus	FLT 3
18 th December 2021	Paper 2 Full Syllabus	FLT 4
22 nd December 2021	Paper 1 Full Syllabus	FLT 5
25 th December 2021	Paper 2 Full Syllabus	FLT 6

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WITH ANSWER EVALUATION

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POLITICAL SCIENCE AND INTERNATIONAL RELATIONS

WITHOUT ANSWER EVALUATION

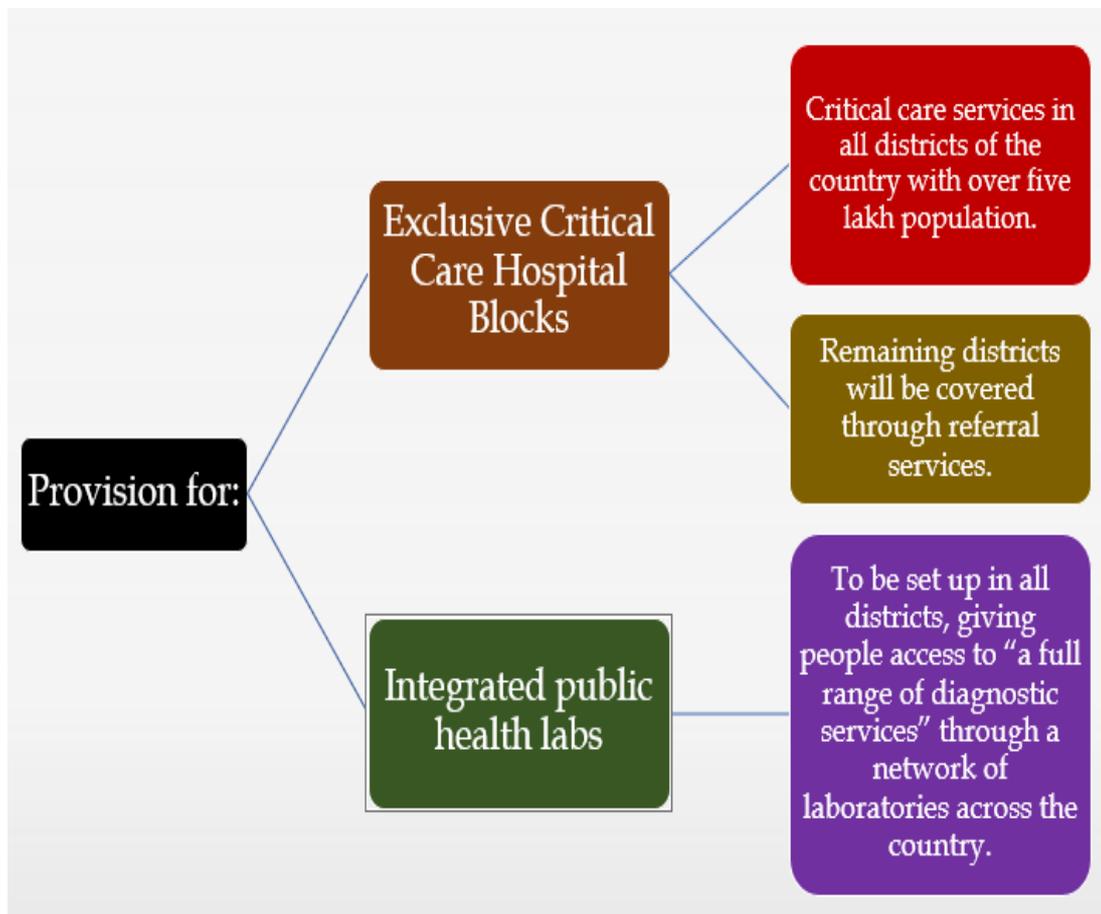
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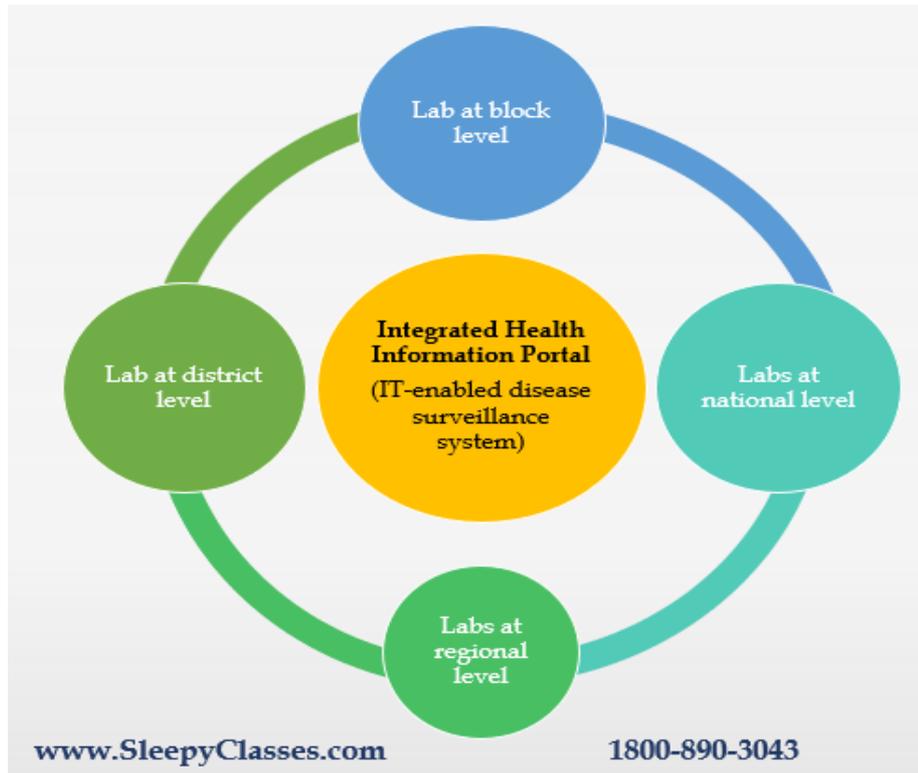


RS. 12,000

What is Ayushman Bharat Health Infrastructure Mission ?

- The **Ayushman Bharat Health Infrastructure Mission** is aimed at ensuring a robust public health infrastructure in both urban and rural areas, capable of **responding to public health emergencies or disease outbreak**.
- The mission's objective is to *"fill critical gaps in public health infrastructure, especially in critical care facilities and primary care in both the urban and rural areas."*
- It is being touted as "India's largest scheme to scale-up health infrastructure". The Ayushman Bharat Health Infrastructure Mission *is an addition to the National Health Mission*, will provide support to:
 - 17,788 rural Health and Wellness Centres in 10 'high focus' states and
 - establish 11,024 urban Health and Wellness Centres across the country.





- The mission aims at ensuring a robust system for “detecting, investigating, preventing, and combating public health emergencies and disease outbreaks”.
- For this, 17 new public health units will be set up, while the 33 existing public health units will be strengthened. It will also train frontline and healthcare workers to respond to public health emergencies effectively.
- Apart from this, the mission will set up other infrastructure:
 - 4 national institutes for virology,
 - 1 regional research platform for WHO’s South East Asia region,
 - 9 biosafety level-III laboratories, and
 - 5 regional centres for disease control.

Need for the Scheme

- A study (**‘State of Democracy in South Asia (SDSA)-Round 3’**) by Lokniti-CSDS in 2019 highlighted:
- Access to public health care remains elusive to those living on the margins. Only 70% of the locations have public healthcare services.
- Availability was less in rural areas (65%) compared to urban areas (87%).
- In 45 per cent of the surveyed locations, people could access healthcare services by walking, whereas in 43 per cent of the locations they needed to use transport.

- Proximity to healthcare services is higher in urban localities: 64 % of the enumerators in urban areas observed that people can access healthcare services by walking, while only 37% in rural areas can do so.
- The **Economic Survey in 2021** pointed out that India has one-of-the highest level of *Out-Of-Pocket Expenditures (OOPE)*.
- Furthermore, the Economic Survey observed that **bulk of the healthcare in India is provided by the private sector.**
- The Survey also underlines that OOPE for health increases the risk of vulnerable groups slipping into poverty because of catastrophic health expenditures.
- It suggested *an increase in public spending from 1% to 2.5-3% of GDP* – as envisaged in the National Health Policy 2017 – can decrease the OOPE from 65% to 30% of overall healthcare spend.
- The Prime Minister had recently launched another scheme, the **Ayushman Bharat Digital Mission** (ABDM), a flagship digital initiative involving the creation of not just a *unique health ID for every citizen*, but also a *digital healthcare professionals* and facilities registry.
- The Covid19 pandemic underlined the need for robust and responsive public health infrastructure to cater to the needs of all citizens.
- There is also need for better public health care professionals. Through its National Centre for Disease Control (NCDC), the Government of India offers a robust two-year field epidemiology training program (Epidemic Intelligence Services).
- However, a separate formal accreditation body in India for MPH courses to ensure there is human resource to enable this infrastructure.

Economy

1. Bad Bank

What is a Bad Bank

- A financial entity set up to buy non-performing assets (NPAs), or bad loans, from banks. They help ease the burden on banks by taking bad loans off their balance sheets.
- The bad bank can then try to restructure and sell the NPA to investors who might be interested in purchasing it.

The primary purpose of a Bad Bank

- To ease the burden on banks which are holding a large pile of stressed assets. So that they can be made to lend more actively.

How does it make Money

- It makes a profit in its operations by managing to sell the loan at a price higher than what it paid to acquire the loan from a commercial bank.

National Asset Reconstruction Company Limited

- NARCL has been set up by banks to aggregate and consolidate stressed assets for their subsequent resolution.
- PSBs will maintain 51% ownership in NARCL.
- NARCL has been incorporated under the Companies Act and has received Reserve Bank of India's license as an Asset Reconstruction Company (ARC).

What is India Debt Resolution Company Ltd. (IDRCL)

- IDRCL is a service company/operational entity which will manage the asset and engage market professionals and turnaround experts.
- Public Sector Banks (PSBs) and Public FIs will hold a maximum of 49% stake and the rest will be with private sector lenders.

Are there any existing ARCs?

- There are 28 existing ARCs.
- They have been helpful in resolution of stressed assets especially for smaller value loans. Considering the large stock of legacy NPAs, additional options/alternatives are needed.
- The NARCL-IRDCL structure announced in the Union Budget is this initiative.

How will NARCL and IDRCL work

- The NARCL will acquire assets by making an offer to the lead bank.
- Once NARCL's offer is accepted, then, IDRCL will be engaged for management and value addition.

How will it benefit Banks

- It will incentivize quicker action on resolving stressed assets thereby helping in better value realization.
- This approach will also permit freeing up of personnel in banks to focus on increasing business and credit growth.
- As the holders of these stressed assets and SRs, banks will receive the gains. Further, it will bring about improvement in bank's valuation and enhance their ability to raise market capital.

What if the Bad Bank's investments didn't pay off

- Government guarantee will be invoked to cover the shortfall between the amount realised from the underlying assets and the face value of SRs issued for that asset.
- It is subject to overall ceiling (initial of ₹30,600 crore, valid for 5 years).
- Since there shall be a pool of assets, it is reasonable to expect that realisation in many of them will be more than the acquisition cost.

Capital structure of NARCL

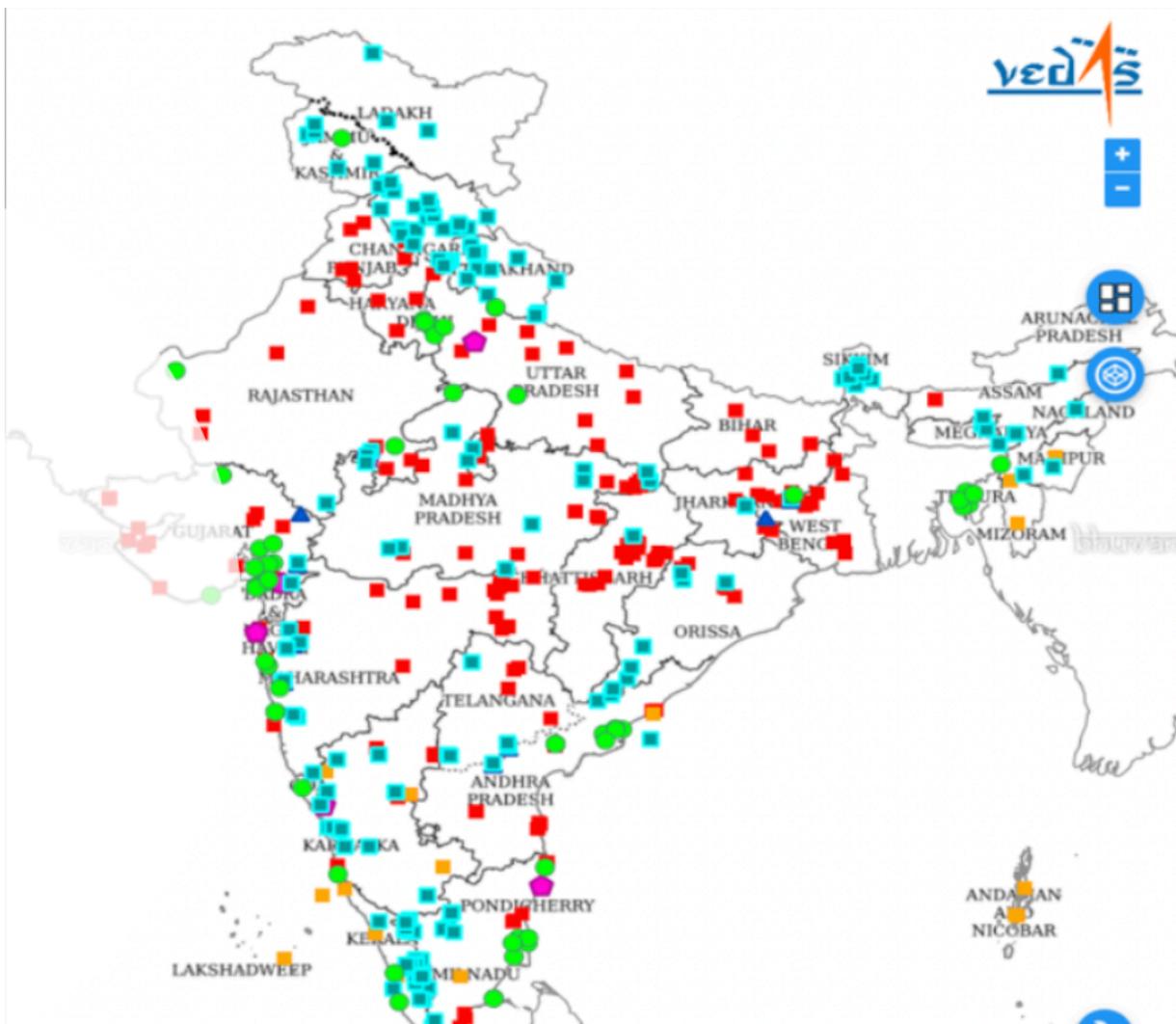
- Capitalization of NARCL would be through equity from banks and Non-Banking Financial Companies (NBFCs).

An important input

- The NARCL will take over identified bad loans of lenders.
- The lead bank with an offer in the hand of the NARCL will go for a 'Swiss Challenge', wherein other asset reconstruction players will be invited to better the offer made by a chosen bidder for finding a higher valuation of a non-performing asset on sale.

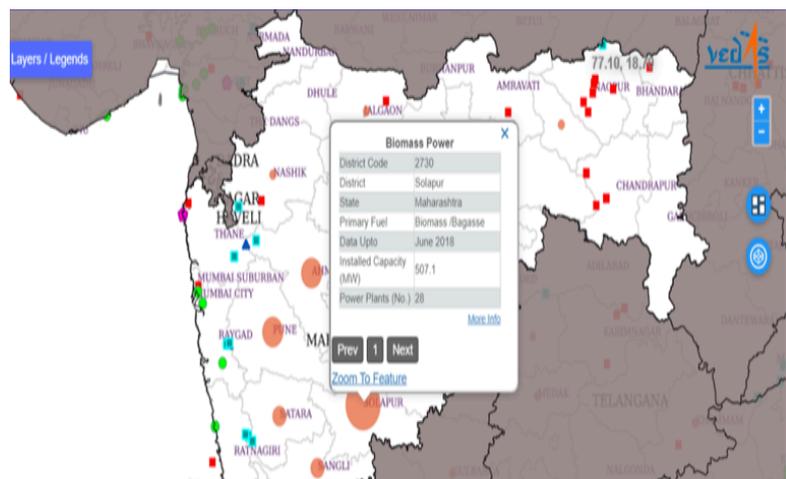
Economy

Geospatial Energy Map of India



What is Geospatial Energy Map of India

- Geospatial energy map attempts to identify and locate all primary and secondary sources of energy and their transportation/transmission networks to provide a comprehensive view of energy production and distribution in India.
- Geographic Information System (GIS) of energy assets will be useful for ensuring integrated planning of energy sector of India, given its large geographical distribution and interdependence.



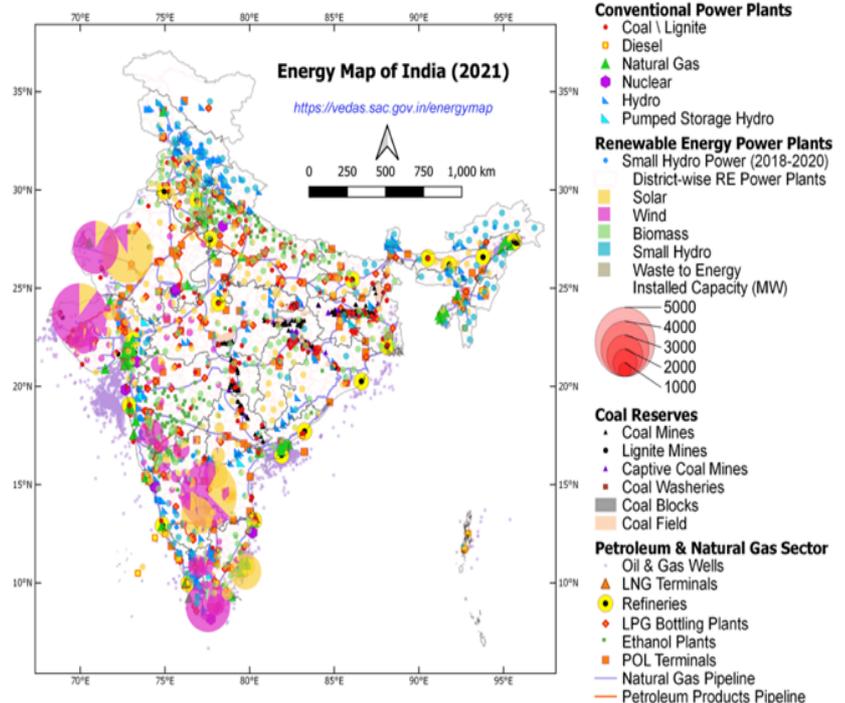
Why Geospatial Energy Map of India

- The energy data in India is **fragmented and scattered** across multiple organisations.
- While **different ministries may have detailed information** and maps, about their respective domain of expertise as per mandate, **there is no consolidated energy map** available in India that may provide a holistic picture of the entire energy sector.
- **Mostly, the available maps are static** (i.e. in PDF or JPG formats), and hence **inhibit integration** with the associated features of topography and other physical infrastructure.



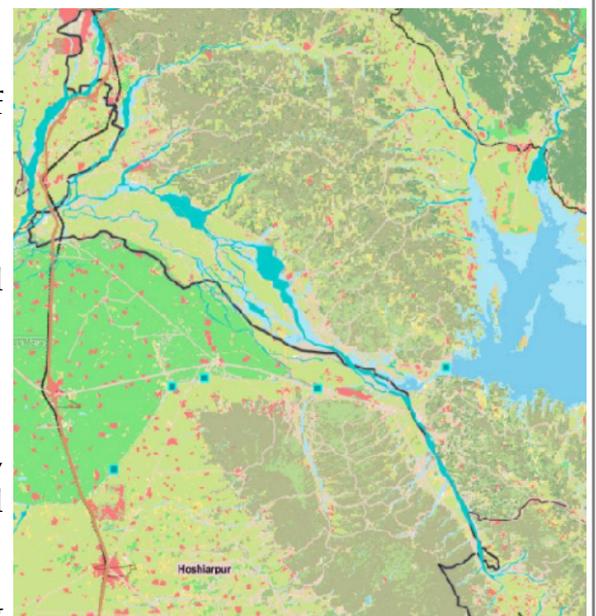
Information Available on

- The web-based geospatial energy map of India enables visualisation of spatial and non-spatial data on:
 - ✓ Renewable power plants
 - ✓ Non-renewable power plants
 - ✓ Oil and gas downstream sector
 - ✓ Renewable energy potential
 - ✓ Fossil fuel resources
 - ✓ Other energy assets in India.



Broader Thematic Layers

- The energy map currently provides visualisation of static data of over 25 thematic layers.
- The static data of all types of:
 - **Conventional** power plants, including thermal (coal, diesel and natural gas)
 - Hydro and nuclear power plants
 - Refineries, LNG terminals, LPG bottling plants, POL terminals, oil and gas wells, coal fields, coal blocks
 - **District-wise data on renewable energy** (including solar, wind, small hydro, biomass & waste to energy plants)



- **Renewable energy resource potential** (wind & solar energy) have been organized and published on the energy map.

It is deployed on

- The web-based geospatial energy map of India has been currently **deployed on VEDAS Server at SAC, Ahmedabad.**
- Visualisation of Earth Observation Data and Archival System (VEDAS).
- **SAC** is Space Applications Centre of ISRO.

Other Possible Uses

- The GIS-based energy map of India may be useful for **geospatial planning of resource.**
- It may be used for:
 - ✓ **Infrastructure planning of upcoming solar parks, coal blocks, crude oil and natural gas pipelines.**
 - ✓ **Investment guidance** for financial institutions
 - ✓ **Disaster management of possible energy**
 - ✓ **Disruption and emergency response**
 - ✓ **Safety of energy assets due to harsh climatic conditions**
 - ✓ **This may also help in resource and environmental conservation measures**
 - ✓ **Inter-state coordination on infrastructure planning including different corridors of energy and transport.**

Economy

Why Shortage of Coal is a Seasonal Thing?

Importance of Coal

- While the rise of renewables is inevitable, given its green benefits and falling costs, there can be no getting away from the **centrality of coal**.
- Coal accounts for **75 per cent of the power generated** in India even if it is about **60 per cent of installed capacity**.
- Coal remains the **energy of the present**, since renewables at current technology levels simply cannot plug supply gaps in real time.

Reasons of Shortfall (short-term)

- **Demand-supply irregularities** caused by Covid.
- A **late monsoon spurt** that halted **mining** (more so in open cast mines).
- A **dry spell** in July-August that spiked **electricity** demand.
- **Low stocks** with power plants.
- **China-driven high import costs**, impacting in particular Gencos which cannot sell at cost-plus to the Discoms.
- **Poor evacuation** logistics.

Reasons of Shortfall (long - Term)

- **Deep financial crisis** in the distribution sector
- **Below-par domestic production** by Coal India Limited (which accounts for over 80 per cent of total coal output)
- **CIL not releasing coal to a number of Gencos** (many State-government owned), **due to non-payment** of dues, which in turn is because the Discoms have not paid them.
- **NITI Aayog's report on Discoms**: A sum of nearly ₹68,000 crore was payable to Gencos as on March 2021.
- **Discoms, in turn, are hit by non-payment of dues** by the States, free supply or irrational tariffs for political reasons, and legacy thermal power purchase contracts that are overpriced.

Way Out - Demand Side Reforms

- **Discoms should not sign “new expensive thermal PPAs”** and should also procure cheaper power from the exchanges where the price is lower than the variable cost of the PPA.
- The **separation of feeders** for agriculture and domestic consumption in rural areas and the use of solar pumps for agriculture.
- The reduction in aggregate technical and commercial losses (at 22 per cent).

Way Out - Supply Side Reforms

- **CIL’s target of hitting one billion tonnes** by 2019-20 has been pushed back to 2024 and should be revamped at the earliest (CIL’s current output is about 600 million tonnes (total sector output is about 720 million tonnes))
- To **reduce import dependency**, CIL must step up its output by plugging **managerial inefficiencies**.
- **Summer production can be improved** to prepare for the monsoon bottleneck, with **optimal use of technology** and know-how support from efficient producers such as **Australia**.
- The **existing PLF of just over 50 per cent at CIL** can improve.
- **Senior posts lie vacant** at CIL, affecting supply management.
- Its **employees appear to have been working for other government schemes**.
- Power plants keeping **sufficient stocks** right through the year and the **Railways** working in tandem.
- The **washerries industry**, which became scam-tainted, should be revived to improve efficiency of coal use.
- Push up **alternate energy sources** such as natural gas and nuclear power.

Important Data to Remember

- Coal Imports exceed 200 million tonnes annually.
- India is the second largest buyer of coal globally, after China.
- Share of renewables in generation is close to 12 per cent even as it accounts for over 25% of the total installed capacity of 388 GW.

Environment

1. All about Tigers

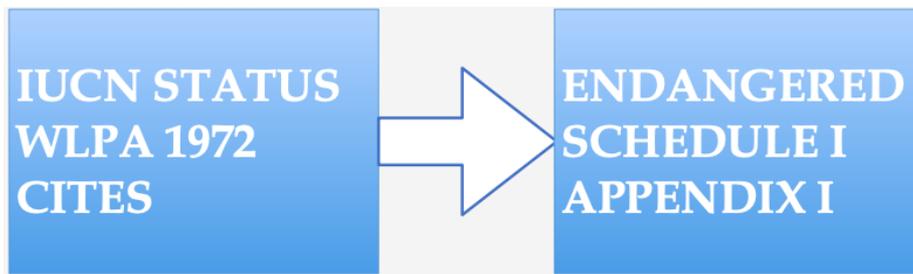
Introduction

- **Top/ Apex Predator** - Presence of tigers in the forest is an indicator of the well being of the ecosystem.
- **Keystone species** - A keystone species is an organism that helps define an entire ecosystem. Without its keystone species, the ecosystem would be dramatically different or cease to exist altogether.

Flagship species

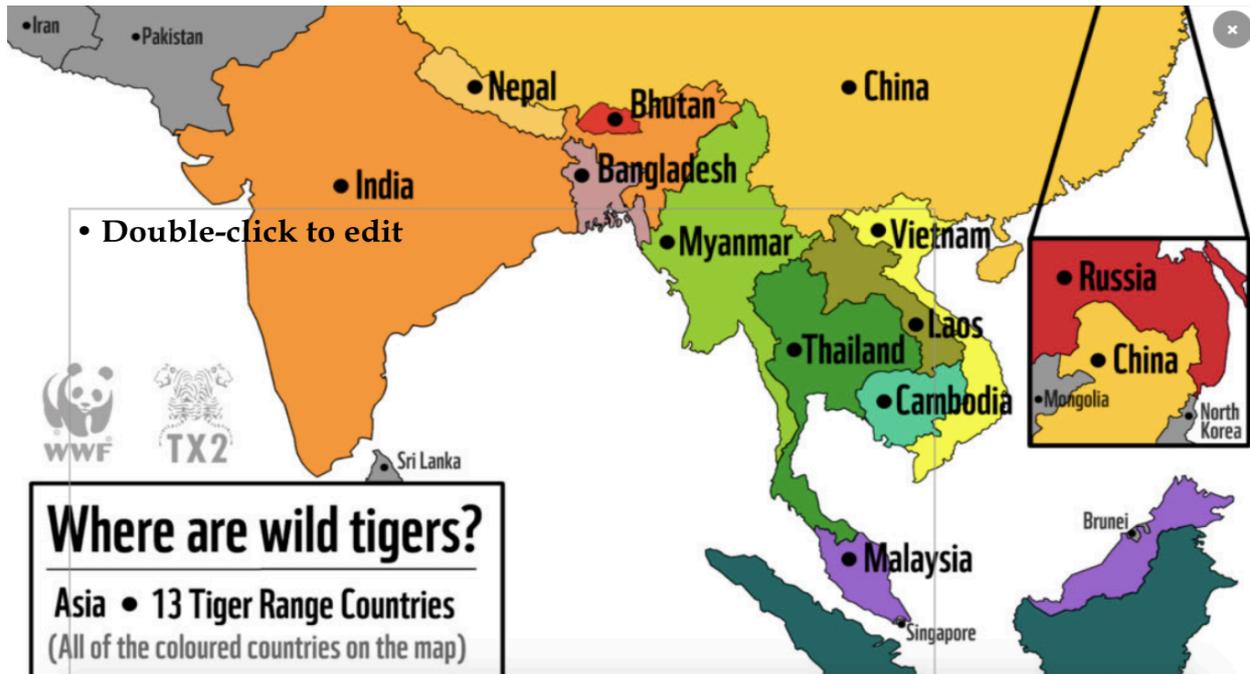
- **Umbrella species** - Their conservation also conserves many other species in the same area.

Tiger Protection



International/Global Tiger Day

- Celebrated on **29th July**.
- It is an **annual celebration** to raise awareness for tiger conservation.
- It was created in **2010 at the Saint Petersburg Tiger Summit in Russia**.
- Theme 2021 - **"Their Survival is in our hands"**
- The **Heads of the Governments of Tiger Range countries at St. Petersburg, Russia**, had resolved to double tiger numbers across their global range by 2022. (TX2 to double wild tiger numbers by 2022, the next year of the tiger after 2010)
- India has achieved the above target of doubling tiger population, **four years in advance**. (**India had around 1,400 tigers in 2006 and 2,967 tigers in 2018**)
- There are currently **13 tiger range countries - India**,
- Bangladesh, Bhutan, Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Russia, Thailand and Vietnam.



Tiger Conservation In India



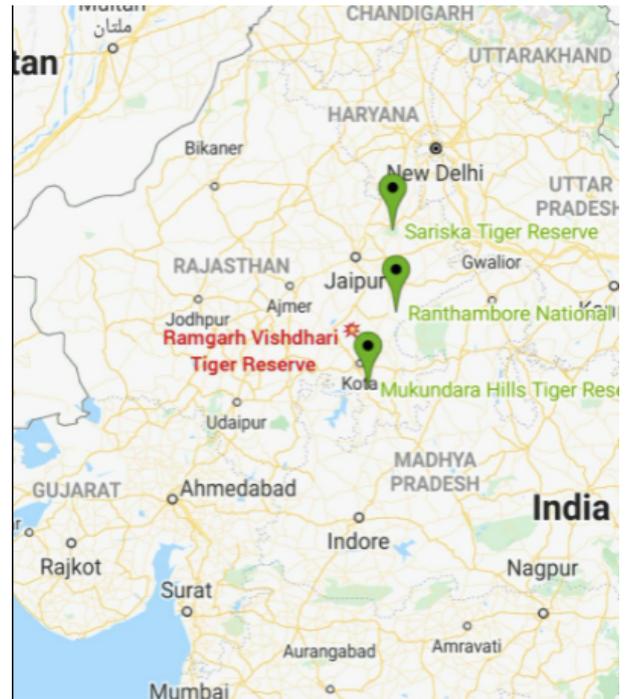
Project Tiger

- **Project Tiger** was launched in 1973 with 9 **tiger reserves** for conserving our national animal, the tiger. (Manas, Palamau, Simlipal, Corbett, Ranthambore, Kanha, Melghat, Bandipur and Sundarbans)
- Currently, there are 52 **tiger reserves** spread out in 18 **tiger range states**. The tiger reserves are constituted on a **core/buffer strategy**.
- The **core areas**(critical tiger habitat) have the **legal status of a national park** or a sanctuary, whereas the **buffer or peripheral areas** are a mix of forest and non-forest land, managed as a multiple use area.
- **Centrally Sponsored Scheme** of the **Ministry of Environment, Forests and Climate Change**.

- **National Tiger Conservation Authority (NTCA)** was established in December 2005, following a recommendation of the **Tiger Task Force**, constituted by the Prime Minister of India for reorganised management of Project Tiger and the many Tiger Reserves in India.
- It was given statutory status by 2006 amendment of Wildlife (Protection) Act, 1972.

Tiger Reserves

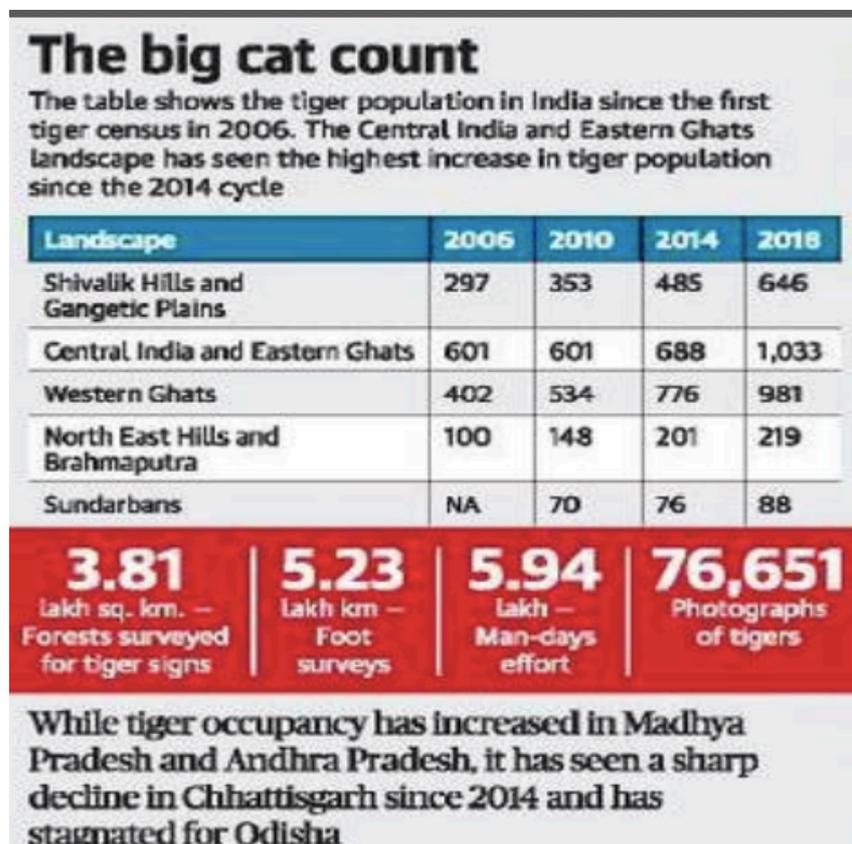
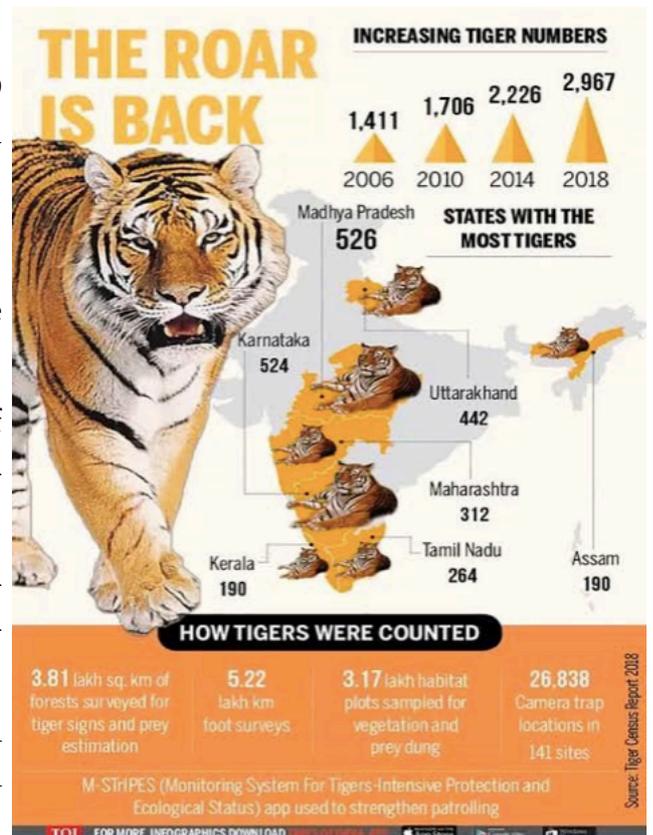
- From 9 to 52.
- Latest one is 52nd, **Ramgarh Vishdhari wildlife sanctuary**, 4th Tiger reserve of Rajasthan.
- **Largest** - Nagarjunsagar-Srisailem in Andhra Pradesh
- **Smallest** - Orang tiger reserve in Assam



- **Maximum** - Madhya Pradesh and Maharashtra (Six each)

Tiger Census

- The national tiger status assessment of 2018-19 estimated the overall tiger population in India at **2,967**.
- **33% increase** since 2014 (2,226).
- Tigers were observed to be increasing at a rate of 6% per annum in India from 2006 to 2018.
- **Madhya Pradesh** has the highest number of tigers at 526, closely followed by **Karnataka (524)** and **Uttarakhand (442)**.
- Increase in Tiger population is seen in **Madhya Pradesh (71%)**, followed by **Maharashtra (64%)** and **Karnataka (29%)**.
- **Chhattisgarh and Mizoram** saw a decline in tiger population while tiger's numbers in Odisha remained constant.
- 4th cycle of the Management Effectiveness Evaluation of Tiger Reserves (MEETR) with **Pench Tiger Reserve, Madhya Pradesh** scoring the highest and **Sathyamangalam Tiger Reserve, Tamil Nadu** showing the highest increment in management, was also released.



Practice Question

Consider the following tiger landscapes:

1. Central Indian Landscape
2. Western Chats
3. Shivalik Hills and Gangetic Plains
4. North-East Hills and Brahmaputra Plains
5. The Sundarbans

Arrange the following in the increasing order of tigers found in them

- A. $1 < 2 < 3 < 4 < 5$
- B. $5 < 4 < 3 < 2 < 1$
- C. $5 < 3 < 2 < 4 < 1$
- D. $5 < 2 < 3 < 4 < 1$

Arrange the following states in decreasing order of their percentage increase in Tiger Population:

1. Karnataka
2. Madhya Pradesh
3. Uttarakhand
4. Maharashtra

Which of the following is/are correct in this context?

- A. $2 > 4 > 3 > 1$
- B. $2 > 4 > 1 > 3$
- C. $2 > 1 > 3 > 4$
- D. $4 > 2 > 3 > 1$

14 Tiger Reserves get CA || TS Accreditation

- Fourteen out of India's 52 tiger reserves have received the Conservation Assured Tiger Standards (CATS) accreditation for meeting a set of standards for effective conservation of big cats.
- The Global Tiger Forum (GTF), an international NGO working on tiger conservation, and World Wildlife Fund India are the two implementing partners of the National Tiger Conservation Authority for CA | TS assessment in India.

- 14 Tiger Reserves are -
 - ✓ Manas, Kaziranga and Orang in Assam
 - ✓ Satpura, Kanha and Panna in Madhya Pradesh
 - ✓ Pench in Maharashtra
 - ✓ Valmiki Tiger Reserve in Bihar
 - ✓ Dudhwa in Uttar Pradesh
 - ✓ Sunderbans in West Bengal
 - ✓ Parambikulam in Kerala
 - ✓ Bandipur Tiger Reserve of Karnataka
 - ✓ Mudumalai and Anamalai Tiger Reserve in Tamil Nadu

Navegaon Nagzira Tiger Reserve

- NNTR comprised of the notified area of Nawegaon National Park, Nawegaon Wildlife Sanctuary, Nagzira Wildlife Sanctuary, New Nagzira Wildlife Sanctuary and Koka Wildlife Sanctuary.
- It is situated in Gondia and Bhandara districts of Maharashtra.
- Strategically, the Tiger Reserve is located in the **heart of central Indian Tiger landscape which contributes almost one sixth of the total tiger population of the country.**
- NNTR has connectivity with the major tiger reserves in Central India like **Kanha and Pench Tiger Reserve in Madhya Pradesh, Pench and Tadoba-Andhari TR in Maharashtra, Indravati tiger Reserve in Chhattisgarh.**
- Indirectly it has connectivity with the **Kawal and Nagarjuna Sagar in Telangana and Andhra Pradesh and, Achanakmar Tiger reserve in Chhattisgarh.**
- It is also connected to important tiger bearing areas like **Umred-Karhandla sanctuary and Bramhapuri division.**



Ranthambore Tiger

- The **increasing tiger population** at Ranthambore Tiger Reserve (RTR) in Sawai Madhopur district has become a concern.
- It is the **third most congested habitats of felines in India** after the **Corbett National Park in Uttarakhand and Kaziranga National Park in Assam.**
- It is bounded to the north by the **Banas River and to the south by the Chambal River.**
- It is named after the historic **Ranthambore Fort**, which lies within the park.



The **Banas** is a river which lies entirely within the state of Rajasthan in western India. It is a tributary of the Chambal River, itself a tributary of the Yamuna, which in turn merges into the Ganga. The Banas is approximately 512 kilometres in length.

The **Chambal River** is a tributary of the Yamuna River in central India, and thus forms part of the greater Gangetic drainage system. The river flows north-northeast through Madhya Pradesh, running for a time through Rajasthan, then forming the boundary between Rajasthan and Madhya Pradesh.

- It represents the **north-western limit** of the Bengal tiger's distribution range.
- It is connected to **Kuno-Palpur Landscape** in Madhya Pradesh, through parts of Kailadevi Wildlife Sanctuary, the ravine habitats of Chambal and the forest patches of Sheopur.
- Tributaries of **River Chambal** provide easy passage for tigers to move towards the Kuno National Park.

Pilibhit Tiger Reserve

- Pilibhit Tiger Reserve located in **Pilibhit and Shahjahanpur Districts of Uttar Pradesh** was notified as a tiger reserve in 2014.
- It forms part of the **Terai Arc Landscape** in the upper Gangetic Plain along the India-Nepal border.
- The habitat is characterized by **sal forests, tall grasslands and swamp** maintained by periodic flooding from rivers.
- The tiger reserve got the first International award TX2 for doubling the tiger population in a stipulated time.
- **Transboundary Manas Conservation Area (TraMCA)** comprising Manas National Park in Assam and Royal Manas National Park in Bhutan also won **Tiger Conservation Excellence Award**.
- Both TX2 Award and Tiger Conservation Excellence Award are part of TX2 Tiger Conservation Awards (TTCA).



The **Pilibhit Tiger Reserve (PTR)** has bagged international award TX2 for doubling the number of tigers in the past four years.

The number of tigers in the reserve area has gone up to **65 from 25** in the period of just four years.

The **United Nations Development Program, Global Tiger Forum and International Union for Conservation of Nature** assessed the work of all the 13 tiger range countries and found that the number of tigers in India's **Pilibhit** reserve has increased at the fastest pace.

- The northeastern boundary of the reserve is the **River Sharda**, which defines the Indo-Nepal border, while the southwest boundary is marked by the **River Sharda and the River Ghaghara**.
- The **Sharda Sagar Dam** extending up to a length of 22 km (14 mi) is on the boundary of the reserve.



The **Sharda River**, also called **Kali River** and **Mahakali River**, originates at Kalapani in the Himalayas at an elevation of 3,600 m (11,800 ft) in the Pithoragarh district in Uttarakhand, India. It flows along Nepal's western border with India and has a basin area of 14,871 km² (5,742 sq mi). It joins



Ghaghara, also called **Karnali** is a perennial trans-boundary river originating on the Tibetan Plateau near Lake Manasarovar. It cuts through the Himalayas in Nepal and joins the Sharda River at Brahmaghat in India. Together they form the Ghaghara River, a major left bank tributary of the Ganges.

Terai ARC Landscape

- It is composed of **14 Indian and Nepalese trans- border protected ecosystems of the Terai (Sanskrit for "lowlands")** and nearby foothills of the Himalayas and encompassing 14 protected areas of Nepal and India.
- The area spans approximately 12.3 million acres (5 million hectares) and includes **Nepal's Bagmati River to the east and India's Yamuna River to the west**.

- The TAL is home to many **endangered mammals** including the **Bengal tiger** (of which it has one of the world's highest densities), the Indian rhinoceros, the wild Asian elephant, the hispid hare, the sloth bear, the South Asian river dolphin and the chital, as well as over **500 species of birds, many endangered.**



Central Indian Landscape

- The Central Indian Landscape (CIL), as defined by the National Tiger Conservation Authority (NTCA) and the Wildlife Institute of India (WII), is spread over the **eight Indian states of Rajasthan, Madhya Pradesh, Jharkhand, Chhattisgarh, Odisha, Andhra Pradesh, Telangana and Maharashtra.**
- Tigers in it are likely from a **common gene pool.**
- With more than **25 tiger reserves and approximately 43 other protected areas** with tiger presence, the CIL is the **second largest tiger landscape** in India and harbors about 700 tigers, representing about 35 per cent of the country's tiger population.
- Of the original nine tiger reserves that constituted Project Tiger during its inception, five tiger reserves (Ranthambhore, Kanha, Melghat, Simlipal and Palamau) were in the CIL.
- Two biosphere reserves, **Simlipal and Pachmarhi**, are also part of the CIL.

Tiger Relocation

- The tiger relocation project was initiated in 2018 wherein two big cats, a male from Kanha Tiger Reserve and a female from Bandhavgarh from Madhya Pradesh were relocated to Satkosia Tiger Reserve in Odisha, to shore up the tiger population in the state.

(Satkosia spreads along the magnificent gorge over the river **Mahanadi in Odisha** and is the meeting point of two bio-geographic regions of India, the **Deccan Peninsula and the Eastern Ghats**)



- The relocation was meant to serve **two purposes**, **reducing tiger population in areas with excess tigers** to majorly reduce territorial disputes, second, **to reintroduce tigers in areas where the population has considerably reduced due to various reasons.**
- Failed due to poaching, villages in buffer areas restricting the movement of tigers, etc
- **National Tiger Conservation Authority (NTCA)** bears the expenses of relocation of villages from core areas and the State government takes responsibility of the buffer zone.
- The **Rajaji Tiger Reserve** got first tiger from **Jim Corbett Tiger Reserve** in the first such relocation in Uttarakhand aimed at tiger population management.

Important Reports

- A report titled 'Skin and Bones Unresolved: An Analysis of Tiger Seizures from 2000-2018' has quantified the illegal global trade in tigers and tiger parts between 2000 and 2018.
- It has been compiled by TRAFFIC in partnership with the World Wildlife Fund (WWF) and the International Union for Conservation of Nature (IUCN).

- The report provides that overall 2,359 tigers were seized from 2000 to 2018 across 32 countries and territories globally.
- Apart from **live tigers and whole carcasses, tiger parts** were seized in various forms such as skin, bones or claws.
- The **top three countries** with the highest number of seizure incidents were **India followed by China and Indonesia.**
- India is the country with the highest number of seizure incidents at **463 or 40% of all seizures.**
- Status of Tigers, Co-predators and Prey in India (2018) Report - Released by Ministry of Environment, Forest and Climate Change.
- As per estimates, India is home to **75% of world tiger population.**
- NTCA in collaboration with state forest departments, NGOs and coordinated by the Wildlife Institute of India (WII), conducts national assessment for the '**Status of Tigers, Co-predators, Prey and their Habitat**' every four years since 2006.
- According to the report, CTR has the highest tiger numbers with 231 inside the reserve and 266 using the reserve.
- CTR is followed by **Nagarhole tiger reserve in Karnataka** with 127 tigers, Bandipur Tiger Reserve (Karnataka) with 126 tigers and Bandhavgarh and Kaziranga tiger reserves with 104 tigers each.
- **Corbett is the only reserve** with more than 200 tigers and with more than 200 tigers and with the highest tiger density in India at 14.
- Good tiger numbers, especially in Corbett is primarily due to **good forest cover that harbours good prey base and focus on better conservation and protection strategies.**
- **Largest contiguous tiger population in the world of about 724 tigers was found in the Western Ghats (Nagarhole-Bandipur-Wayanad -Mudumalai- Satyamangalam-BRT block).**
- Second largest population of about 604 tigers was found across Uttarakhand and western Uttar Pradesh (Rajaji-Corbett-Ramnagar - Pilibhit -Dudhwa block).

Black Tiger

- **Black tigers of Similipal in Odisha** may be associated with a **single mutation in a gene** that causes their **distinctive stripes to broaden and spread** into their tawny pelt, occasionally appearing entirely dark.
- It is due to a single mutation in the **Transmembrane Aminopeptidase Q (Taqqep) gene.**
- Tigers in the Similipal Tiger Reserve are an **isolated population in eastern India, and gene flow between them and other tiger populations is very restricted.**

- The researchers noted that this has **important implications** for tiger conservation as such **isolated and inbred populations are prone to extinction over even short periods of time.**
- It offers them a **selective advantage** when hunting in the dense closed-canopy and relatively darker forested areas of Similipal as compared to the open plains of most other tiger habitats.



Golden Tiger

- **Kazi 106F is India's only Golden Tiger found in Kaziranga National Park of Assam.**
- A golden tiger, also called **tabby tiger or strawberry tiger**, is a tiger with a color variation caused by a recessive gene.
- The **yellow skin** of tigers is controlled by a set of '**agouti genes**' while the black stripes are controlled by 'tabby genes' and their alleles.
- **Suppression of any of these genes** may lead to color variation in a tiger.
- It is also a result of **excessive inbreeding.**



Environment

1. Climate Finance

Introduction

- It refers to **local, national or transnational financing** drawn from **public, private and alternative sources** of financing that seeks to support mitigation and adaptation actions that will address climate change.
- The Convention, the **Kyoto Protocol and the Paris Agreement** call for financial assistance from Parties with more financial resources to those that are less endowed and more vulnerable.
- Several financial mechanisms to address climate change are currently in place -
 - ✓ Global Environment Facility (GEF)
 - ✓ Special Climate Change Fund (SCCF)
 - ✓ Least Developed Countries Fund (LDCF)
 - ✓ Clean Development Mechanism (CDM)
 - ✓ Adaptation Fund
 - ✓ Climate Investment Fund (CIF)
 - ♣ Clean Technology Fund: Finances demonstration, deployment, and transfer of low carbon technologies.
 - ♣ Strategic Climate Fund: Targeted programs to pilot new approaches and improvements.
- Community Development Carbon Fund

Global Environment Facility

- The Global Environment Facility (GEF) was established 30 years ago on the eve of the **Rio Earth Summit** to tackle our planet's most pressing environmental problems.
- The GEF is the **largest multilateral trust fund** focused on enabling developing countries to invest in nature, and supports the implementation of major international environmental conventions including on biodiversity, climate change, chemicals, and desertification.
- It brings together **184 member governments in addition to civil society**, international organization, and private sector partners.
- The financial contributions to the GEF are replenished **every four years**. The Fund is currently in its 7th replenishment cycle, GEF-7: 2018 - 2022
- Through its **Small Grants Programme**, the GEF has provided support to more than 25,000 civil society and community initiatives in 135 countries.

- An independently operating financial organization, the GEF provides grants for projects related to **biodiversity, climate change, international waters, land degradation, the ozone layer, persistent organic pollutants (POPs), mercury, sustainable forest management, food security, sustainable cities.**
- The GEF also serves as **financial mechanism** for the following conventions:
 - ✓ Convention on Biological Diversity (CBD)
 - ✓ United Nations Framework Convention on Climate Change (UNFCCC)
 - ✓ United Nations Convention to Combat Desertification (UNCCD)
 - ✓ Stockholm Convention on Persistent Organic Pollutants
 - ✓ Minamata Convention on Mercury
- The GEF, although **not linked formally to the Montreal Protocol** on Substances that Deplete the Ozone Layer (MP), supports implementation of the Protocol in countries with economies in transition.

PYQ 2014

With reference to 'Global Environment Facility', which of the following statements is/are correct?

- A. It serves as financial mechanism for 'Convention on Biological Diversity' and 'United Nations Framework Convention on Climate Change'.
- B. It undertakes scientific research on environmental issues at global level
- C. It is an agency under OECD to facilitate the transfer of technology and funds to underdeveloped countries with specific aim to protect their environment.
- D. Both A and B

Small Grants Programme

- The **GEF Small Grants Programme (SGP)** provides **financial and technical support to communities** and Civil Society Organizations to meet the overall objective of global environmental benefits secured through community-based initiatives and actions.
- **Launched in 1992** with 33 participating countries, the Small Grants Programme has expanded to provide assistance to 125 countries currently.
- It is currently **implemented** by UNDP on behalf of the GEF partnership.
- The SGP remains one of the **GEF's flagship initiatives** and it enjoys strong and broad support from its stakeholders, country governments, GEF donors and civil society and community based organizations.

- The Small Grants Programme, through a **decentralized, national-level delivery mechanism, finances community-led initiatives to address global environmental issues.**
- The Program is specifically designed to mobilize bottom-up actions by empowering local civil society organizations, and poor and vulnerable communities, including women and Indigenous Peoples.
- The Programme funds grants up to a **maximum of \$50,000.**
- In practice, the average grant has been around \$25,000. In addition, the SGP provides a maximum of **\$150,000 for strategic projects.**
- These larger projects allow for scaling up and cover a large number of communities within a critical landscape or seascape.
- Projects under the SGP are implemented through a **National Host Institution - Centre for Environment Education (CEE)**, and other NGO partners and stakeholders that has presence in different parts of the country.

Special Climate Change Fund

- The **Special Climate Change Fund**, one of the world's first multilateral climate adaptation finance instruments, was created at the **2001 Conference of the Parties (COP)** to the United Nations Framework Convention on Climate Change (UNFCCC) to help **vulnerable nations to address these negative impacts of climate change.**
- The SCCF is **managed by the GEF** and operates in parallel with the **Least Developed Countries Fund (LDCF).**
- Both funds have a mandate to serve the **Paris Agreement.**
- SCCF financing is open to all vulnerable developing countries and supports a wide spectrum of adaptation activities, including innovative tools that can be scaled for impact.

Least Developed Countries Fund

- In 2001, the 194 parties to the **United Nations Framework Convention on Climate Change (UNFCCC)** set out to address this challenge by establishing the **Least Developed Countries Fund (LDCF) - the only facility exclusively dedicated** to helping these countries adapt to **new climate realities.**
- The LDCF, along with the Special Climate Change Fund (SCCF), is mandated to serve the Paris Agreement.
- Both funds are **managed by the Global Environment Facility.**
- LDCF backing helps countries implement **National Adaptation Programs of Action (NAPAs)** - country-driven strategies for addressing their most urgent adaptation needs.
- It also supports the implementation of the National Adaptation Plan (NAP) process, and the Least Developed Country work program under the UNFCCC.

Clean Development Mechanism

- The Clean Development Mechanism (CDM) refers to a market mechanism for achieving greenhouse gas emissions reduction and is defined in **Article 12 of the Kyoto Protocol - an international treaty for emissions reductions.**
- CDM allows an **industrialized/developed country** with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (called as Annex I Party or Annex B Party of the original Kyoto Protocol signed in 1997) **to implement an emission-reduction project in any of those developing countries** (which may otherwise be not financially capable of undertaking such projects), thereby earning them tradable **Certified Emission Reduction (CER) credits, each equivalent to one tonne of CO₂.**
- The saleable CERs earned from such projects can be counted towards meeting the **prescribed Kyoto targets.**

Adaptation Fund

- The Adaptation Fund is an international fund that finances projects and programs aimed at helping **developing countries to adapt to the harmful effects of climate change.**
- It is **set up** under the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC).
- The Adaptation Fund was **officially launched in 2007**, although it was established in 2001 at the 7th Conference of the Parties (COP7) to the UNFCCC in Marrakech, Morocco
- The Fund is financed in part by **government and private donors, and also from a two percent share of proceeds of Certified Emission Reductions (CERs)** issued under the Protocol's Clean Development Mechanism projects.
- The Fund is **supervised and managed by the Adaptation Fund Board (AFB).**
- The AFB is composed of 16 members and 16 alternates and meets at least twice a year.
- The **World Bank** serves as trustee of the Adaptation Fund on an interim basis.

Green Climate Fund

- It was established **to limit or reduce greenhouse gas (GHG) emissions** in developing countries and to help vulnerable societies adapt to the unavoidable impacts of climate change.
- **The Green Climate Fund (GCF) is a fund established within the framework of the UNFCCC** as an operating entity of the Financial Mechanism to assist developing countries in adaptation and mitigation practices to counter climate change.
- Established at Conference of Parties (COP-16) in Cancun, Mexico 2010.
- The GCF is based in **Incheon, South Korea.**
- It is governed by a Board of 24 members and supported by a Secretariat.

- National Bank for Agriculture and Rural Development (NABARD) and Small Industries Development Bank of India (SIDBI) act as **National Implementing Entity (NIE) of India for Green Climate Fund (GCF)**.

PYQ 2015

Which of the following statements regarding 'Green Climate Fund' is/are correct?

1. It is intended to assist the developing countries in adaptation and mitigation practices to counter climate change.
2. It is founded under the aegis of UNEP, OECD, Asian Development Bank and World Bank.

Select the correct answer using the code given below.

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

Clean Investment Fund

- It is an \$8 billion multi-donor trust fund that seeks to accelerate climate action by empowering transformations in clean technology, energy access, climate resilience, and sustainable forests in developing and middle-income countries.
- CIF is comprised of **four funds**:
 - ✓ The Clean Technology Fund (CTF); the Forest Investment Program (FIP); the Scaling up Renewable Energy in low-income countries Program (SREP); and the Pilot Program for Climate Resilience (PPCR).
 - ✓ **Founded in 2008**, CIF is the only multilateral climate fund to work exclusively with **multilateral development banks (MDB)** as implementing agencies.
 - ✓ IFC is one of five MDBs that can access CIF funds to implement projects.
 - ✓ Through its blended finance practice, **IFC co-invests concessional funding provided by CIF alongside its own funds**.
 - ✓ The CIF-IFC blended finance partnership **supports the deployment and testing of climate resilience and adaptation projects**, meeting the need for critical climate interventions around the world.

Community Development Carbon Fund

- At the World Summit on Sustainable Development in Johannesburg in 2003, the **World Bank** launched a \$100m Community Development Carbon Fund (CDCF), in collaboration with the **International Emissions Trading Association (IETA)**.

- The CDCF will provide **carbon finance to small-scale projects in small developing countries and rural areas of all developing countries.**
- The **emphasis within the CDCF** will be on renewable energy, energy efficiency, methane capture, and agro-forestry projects, with significant and measurable community development benefits.
- When the CDCF was established in 2003, two years before the ratification of the Kyoto Protocol, the carbon market was still in its infancy.

Fund	Fund Type	Fund focus
Adaptation for Smallholder Agriculture Programme (ASAP)	Multilateral	Adaptation
Adaptation for Smallholder Agriculture Programme (ASAP+)	Multilateral	Multiple Foci
Adaption Fund	Multilateral	Adaptation
Amazon Fund	Multi Donor National	Mitigation - REDD
BioCarbon Fund	Multilateral	Mitigation - REDD
Central African Forest Initiative (CAFI)	Multi Donor Regional	Mitigation - REDD
Clean Technology Fund (CTF)	Multilateral	Mitigation - General
Congo Basin Forest Fund (CBFF)	Multi Donor Regional	Mitigation - REDD
Forest Carbon Partnership Facility - Readiness Fund (FCPF-RF)	Multilateral	Mitigation - REDD
Forest Carbon Partnership Facility - Carbon Fund (FCPF-CF)	Multilateral	Mitigation - REDD

Fund	Fund Type	Fund focus
Forest Investment Program	Multilateral	Mitigation - REDD
Global Environment Facility (GEF4)	Multilateral	Multiple Foci
Global Environment Facility (GEF5)	Multilateral	Multiple Foci
Global Environment Facility (GEF6)	Multilateral	Multiple Foci
Global Environment Facility (GEF7)	Multilateral	Multiple Foci
Global Climate Change Alliance	Multilateral	Multiple Foci
Global Energy Efficiency and Renewable Energy Fund	Multilateral	Mitigation - General
Green Climate Fund (GCF IRM)	Multilateral	Multiple Foci
Green Climate Fund (GCF-1)	Multilateral	Multiple Foci
Indonesia Climate Change Trust Fund (ICCTF)	Multi Donor National	Multiple Foci

Fund	Fund Type	Fund focus
Least Developed Countries Fund	Multilateral	Adaptation
MDG Achievement Fund	Multilateral	Adaptation
Partnership for Market Readiness	Multilateral	Mitigation - General
Pilot Program for Climate Resilience	Multilateral	Adaptation
Scaling-Up Renewable Energy Program for Low Income Countries	Multilateral	Mitigation - General
Special Climate Change Fund	Multilateral	Adaptation
UN-REDD Programme	Multilateral	Mitigation - REDD

PYQ 2015

BioCarbon Fund Initiative for Sustain-able Forest Landscapes’ is managed by the

- A. Asian Development Bank
- B. International Monetary Fund
- C. United Nations Environment Programme
- D. World Bank

With reference to ‘Forest Carbon Partnership Facility’, which of the following statements is/are correct?

1. it is global partnership of governments, businesses, civil society and indigenous peoples
2. it provides financial aid to universities, individual scientists and institutions involved in scientific forestry research to develop eco-friendly and climate adaptation technologies for sustainable forest management
3. It assists the countries in their ‘REDD+ (Reducing Emission from Deforestation and Forest Degradation+)’ efforts by providing them with financial and technical assistance.

Select the correct answer using the code given below

- A. 1 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

Environment

1. COP 26 - UNFCCC GLASGOW - SCOTLAND

Introduction

- The COP 26 UN Climate Change Conference, **hosted by the UK in partnership with Italy**, will take place from 31 October to 12 November 2021 in Glasgow, UK.
- In light of the worldwide effects of COVID-19, the COP Bureau of the UNFCCC, with the UK and its Italian partners, **had decided to re-schedule the conference initially slated for November 2020.**
- **Italy partnered with the UK in leading COP26.**
- For the most part, their role was in **preparatory work** such as the hosting of a pre-COP session and an event for young people called **Youth4Climate 2020: Driving Ambition.**
- These events took place between 28 September and 2 October 2020 in Milan.

Formation of COP

- The Conference of Parties comes under the **United Nations Climate Change Framework Convention (UNFCCC) which was formed in 1994.**
- The UNFCCC was established to work towards **“stabilisation of greenhouse gas concentrations in the atmosphere.”**
- It laid out a **list of responsibilities** for the member states which included:
 - ✓ Formulating measures to mitigate climate change
 - ✓ Cooperating in preparing for adaptation to the impact of climate change
 - ✓ Promoting education, training and public awareness related to climate change

COP 1 TO COP 25

- COP members have been meeting every year since 1995.
- The UNFCCC has 198 parties including India, China and the USA.
- The **first conference (COP1)** was held in 1995 in Berlin.
- At COP3 held in Kyoto, Japan, in 1997, the famous **Kyoto Protocol was adopted.**
- It commits the member states to **pursue limitation or reduction of greenhouse gas emissions.**
- It entered into force on 16 February 2005 and there are 192 Parties in the Kyoto Protocol.
- India hosted the eighth COP from October 23 to November 1, 2002 in New Delhi.

- ✓ The conference laid out seven measures including, 'strengthening of technology transfer... in all relevant sectors, including energy, transport...and the promotion of technological advances through research and development...and the strengthening of institutions for sustainable development.'
- One of the most important conferences, **COP21 took place from November 30 to December 11, 2015, in Paris, France.**
 - ✓ Member countries agreed to work together to 'limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre- industrial levels.'
 - ✓ COP 26 is also the third meeting of the parties to the Paris Agreement (CMA3).

Ratchet Mechanism

- Under the Paris Agreement, countries submitted pledges called **nationally determined contributions**, to limit their greenhouse gas emissions.
- Under the framework of the Paris Agreement, each country is expected to **submit enhanced nationally determined contributions every five years**, to ratchet up ambition to mitigate climate change.
- When the Paris Agreement was signed at the 2015 United Nations Climate Change Conference, **the conference of 2020 was set to be the first iteration of the ratchet mechanism.**
- Even though the 2020 conference was postponed to 2021 due to pandemic, dozens of countries still had not updated their pledges by early October 2021.
- Future iterations will also take into account the "**global stocktake**", the first of which is in 2023.

COP 26 Goals

- According to the UNFCCC, COP26 will work towards four goals
 - ✓ Secure global net-zero by mid-century and keep 1.5 degrees within reach
 - ❖ UK has already committed to bringing 78% emission reductions by 2035 and is on the road to net-zero by 2050.
 - ❖ India has also taken important steps with its 450 gigaWatt renewables target and national hydrogen mission.
 - ❖ Different countries will have different pathways, and we recognise the principle of common but differentiated responsibilities.
 - ❖ The UNFCCC recommends that countries 'accelerate the phase-out of coal, curtail deforestation, speed up the switch to electric vehicles and encourage investment in renewables' to meet this goal.
 - ✓ At the National Conference on COP26 Charter of Actions, India announced what it could do to reach its targets:

- ✓ It is time for India to update its Nationally Determined Contributions or NDCs. (NDCs detail the various efforts taken by each country to reduce the national emissions)
- ✓ Sector by sector plans are needed to bring about development. There is need to decarbonise the electricity, transport sector and start looking at carbon per passenger mile.
- ✓ Aggressively figure out how to transition our coal sector.
- **Adapt to protect communities and natural habitats**
 - ✓ Countries will work together to ‘protect and restore ecosystems and build defences, warning systems and resilient infrastructure and agriculture to avoid loss of homes, livelihoods and even lives.’
- ✓ **Mobilise finance**
 - ❖ To deliver on our first two goals, developed countries must make good on their promise to mobilise at least \$100bn in climate finance per year by 2020.
 - ❖ With the impacts of COVID-19, there is a need **to scale up finance from all sources and improve its access.**
 - ❖ There is a need to push for all countries to have National Adaptation Plans in place and to produce Adaptation Communications sharing best practices to help turn ambition into action.
- **Work together to deliver**
 - ✓ Another important task at the COP26 is to **‘finalise the Paris Rulebook’.**
 - ✓ Leaders will work together to frame a list of detailed rules that will help fulfil the Paris Agreement.

Environment

Article - 6

Paris Agreement

Introduction

- A little-known and highly technical section of the Paris Agreement could “make or break” the regime and its aim of avoiding dangerous climate change.
- These “Article 6” rules, for carbon markets and other forms of international cooperation, are the last piece of the Paris regime to be resolved, after the rest of its “rulebook” (detailed “operating manual” needed for the Paris Agreement to enter into force) was agreed in late 2018 (COP24 took place in 2018, in Katowice, Poland).

International Carbon Markets

- Countries that struggle to meet their emissions-reduction targets under their national climate plans (known as “nationally determined contributions,” or NDCs), or want to pursue less expensive emissions cuts, can purchase emissions reductions from other nations that have already cut their emissions more than the amount they had pledged.
- If the rules are structured appropriately, the result can be a win-win for everyone involved, both countries meet their climate commitments, the overachiever is financially rewarded for going above and beyond, finance is provided to the country generating the emissions reductions, and the world gets a step closer to avoiding catastrophic climate change.

Article 6

- Article 6 of the Paris Agreement introduces provisions for using international carbon markets to facilitate fulfilment of Nationally Determined Contributions (NDCs) by countries.
- The success of COP26 at Glasgow hinges, to a great extent, on the conclusion of carbon markets discussions.
- Despite several rounds of high-level meetings, it remains one of the most technical and highly contentious unresolved issues of the PAWP.
- Article 6 of the Paris Agreement aims at promoting integrated, holistic and balanced approaches that will assist governments in implementing their NDCs through voluntary international cooperation.
- This cooperation mechanism, if properly designed, should make it easier to achieve reduction targets and raise ambition.

- In particular, Article 6 could also establish a policy foundation for an emissions trading system, which could help lead to a global price on carbon.
- Under this mechanism, countries with low emissions would be allowed to sell their exceeding allowance to larger emitters, with an overall cap of greenhouse gas (GHG) emissions, ensuring their net reduction.
- Supply and demand for emissions allowances would lead to the establishment of a global carbon price that would tie the negative externalities of GHG emissions to polluters.
- In other words, by paying a price on carbon, states exceeding their NDCs would bear the costs of global warming.
- Measures under Article 6 support and contribute to two clear goals of the Paris Agreement: delivering emission reductions and mobilizing investments.

Article 6 has three operative paragraphs, two of which relate to carbon markets:

Article 6.2 provides an accounting framework for international cooperation, such as linking the emissions-trading schemes of two or more countries (for example, linking the European Union cap-and-trade program with emissions-reduction transfers from Switzerland).

- It also allows for the international transfer of carbon credits between countries.

Article 6.4 establishes a central UN mechanism to trade credits from emissions reductions generated through specific projects.

- For example, country A could pay for country B to build a wind farm instead of a coal plant.
- Emissions are reduced, country B benefits from the clean energy and country A gets credit for the reductions.

Article 6.8 establishes a work program for non-market approaches, such as applying taxes to discourage emissions.

Unpacking A6 of the PA

- A6.1 preamble, unitary objectives:
Voluntary, allow for higher ambition of NDCs, promote SD and EI

	Art. 6.2 'Cooperative approaches'	Art. 6.4 'Mechanism'	Art. 6.8 'Framework and work program'
'Rulebook' description	Guidance for cooperative approaches	Rules, modalities and procedures for the mechanism	A work programme under the framework for non-market approaches
Governance	Bottom-up, nationally determined	Top-down, centrally managed, 'CDM-like'	'Body' vs. 'Contact group' for impl., unclear
ITMOs	Yes	Yes	No

The **three critical issues** that would be hotly debated in Article 6 negotiating rooms are

- CDM Transition,
- Accounting rules and
- Share of Proceeds to the Adaptation Fund.

CDM Transition

- The CDM projects have gone through due diligence and credits have been issued under UNFCCC oversight.
- Therefore, the Article 6 mechanism should honour the previous decisions and allow for a smooth transition of these projects and credits to ensure not only the viability of these projects but also inspire trust among the private investors in the UNFCCC decision-making process.
- However, some countries have cast doubts on the environmental integrity of these credits and while there is greater acceptance for transition of projects/activities, the same is not the case for transition of credits.
- If the decision regarding transition of CDM is not favourable, it could lead to a loss of billions of dollars' worth of potential revenue to India alone.
- A possible landing zone can be that the new supervisory body to be formed under the Paris Agreement can re-examine the validity and rigour of such credits.

Accounting Rules

- Article 6.4 mechanism is meant to incentivise the private sector and public entities to undertake mitigation activities for sustainable development.
- Under this mechanism, a country can purchase emission reductions from public and private entities of the host country and use it to meet its NDC targets.
- However, this does not automatically imply that emission reductions transferred from a host country be adjusted against its NDC targets.
- It must be appreciated that these reductions represent additional efforts of the private sector or public entities to mitigate greenhouse gas emissions, and in fact raise global climate ambition.
- This is also in line with the provision of Article 6.5 of the Paris Agreement wherein the host country is not required to undertake corresponding adjustment for the projects outside its NDC.

Share of Proceeds to the Adaptation Fund

- For developing countries, adaptation is a necessity.
- However, it remains severely underfunded compared to financing for mitigation activities.

- While developing countries emphasise that the SOP must be uniformly applied to Articles 6.2 and 6.4 to fund adaptation, developed countries want to restrict its application to Article 6.4.
- This would disincentivise the Article 6.4 mechanism and limit voluntary cooperation to the cooperative approaches under Article 6.2 favoured by developed countries.

Article 6 Rules if not Designed Properly

- Without the right rules in place, Article 6 could actually weaken countries' NDCs and increase global emissions. There are a few ways in which this could happen:

Double-Counting:

For example, country A might build a wind farm and then sell the credits for those emissions reductions to country B, so now country B can count those emissions reductions as part of its progress to achieving its NDC.

- But if country A claims those same emissions reductions toward achieving its own NDC, that is double-counting.
- While the Paris Agreement is clear that double-counting must be avoided under Article 6, the extent to which double-counting is actually avoided depends on how accounting rules are operationalized.
- If emissions reductions are double-counted, it will potentially result in an increase in global emissions and weaken the already inadequate NDCs.

Additionality:

- The way in which Article 6 is finalized will dictate whether emissions reductions under Article 6 will be additional to what would have occurred anyway.
- For example, if country A was already going to build that wind farm instead of a coal plant, here the carbon market didn't offer a climate benefit.
- Without guidance ensuring additionality of emissions reductions, Article 6 rules could weaken NDCs.

Failing to deliver increased ambition and progression:

- Article 6 can be designed in a way that either supports or hinders increased ambition -- for example, by determining whether subsequent NDCs will be incentivized to increase coverage of GHGs and sectors over time, and whether transfers of emissions reductions will result in greater emissions cuts.

Science & Technology

Nobel Prize for Asymmetric Organocatalysis

Nobel Prize in Chemistry

The 2021 Nobel Prize in Chemistry was awarded to **Benjamin List and David W C MacMillan** “for the development of **asymmetric organocatalysis**”.

- The new catalysts, **derived from naturally-occurring chemicals**, were greener and cheaper, and ensured that the end product of the chemical reaction was of a specific variety – and **did not need to go through a purification process to yield the desired type of compound**.

Catalyst

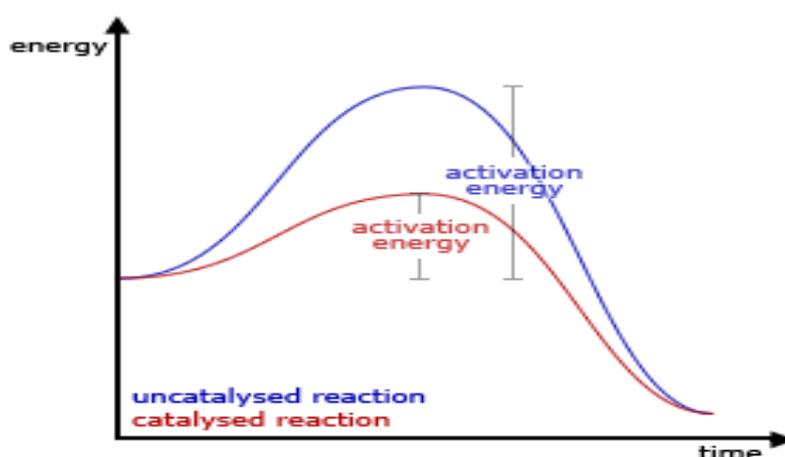
- A substance that speeds up the rate of a chemical reaction but is not consumed during the course of the reaction

Features

- A catalyst does not initiate a chemical reaction.
- A catalyst does **not be consumed** in the reaction.
- Catalysts tend to react with reactants to **form intermediates** and at the same time facilitate the production of the final reaction product. After the whole process, a **catalyst can regenerate**.

Mechanism of action

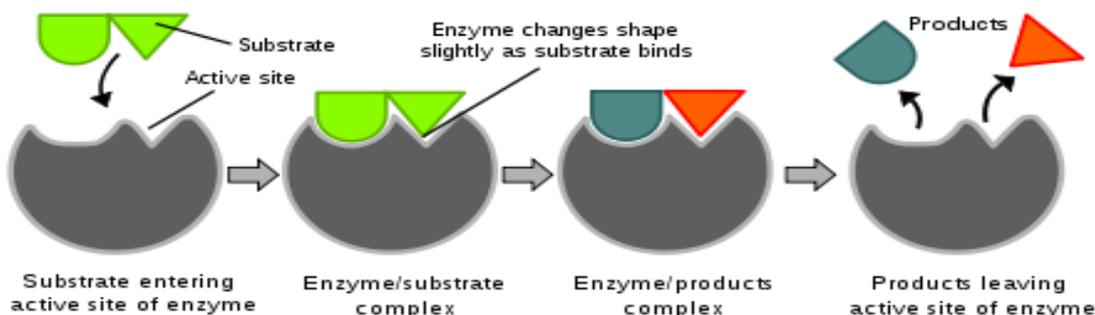
- The effect of a catalyst is that it lowers the activation energy for a reaction.
- Generally, this happens because the catalyst changes the way the reaction happens (the mechanism).



Enzyme

- Enzymes are biological catalysts. They are proteins that fold into particular conformations such that they can help speed up very particular chemical reactions



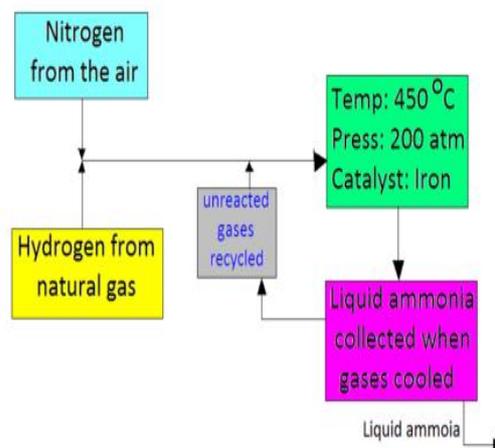


Catalyst

Types

Positive Catalysts

- Catalysts that increase the rate of a chemical reaction are positive catalysts.
- E.g. Haber process
- In the preparation of NH_3 by **Haber's process** Iron oxide acts as a positive catalyst and increases the yield of ammonia in spite of less reaction of Nitrogen.



Types

Negative Catalysts

- It **decreases the rate of reaction by increasing the activation energy barrier** which decreases the number of reactant molecules to transform into products and hence the rate of reaction decreases.
- E.g. Decomposition of Hydrogen peroxide into water and oxygen is retarded by using Acetanilide.



Hydrogen peroxide decomposes to water and oxygen. The uncatalysed reaction has activation energy of 86 KJ/mol. The activation energy value in the presence of acetanilide is 112 KJ/mol and in the presence of MnO_2 it is 49 KJ/mol. What conclusion can you draw from the above observations?

Reason for Nobel Prize

- Till around 2000, only **two kinds of chemicals** were known to act as effective catalysts:
 1. **Metals**, mainly heavier metals
 2. **Enzymes**, naturally-occurring heavy molecules that facilitate all life-supporting biochemical processes. Both these sets of catalysts **had limitations**.

Issues

- **Heavier metals are expensive**, difficult to mine, and toxic to humans and the **environment**.
- Despite the best processes, traces remained in the end product; this posed problems in situations where compounds of **very high purity were required, like in the manufacture of medicines**.
- Also, **metals required an environment free of water and oxygen**, which was difficult to ensure on an industrial scale.
- **Enzymes** on the other hand, work best when water is used as a medium for the chemical reaction. But that is **not an environment suitable for all kinds of chemical reactions**.

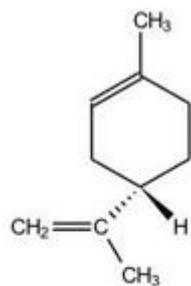
Asymmetric Catalysis

- The **individual amino acids** had an added advantage: they ensured only one variety of the end product was yielded in the reaction.
- **Substances can have exactly the same chemical composition** and molecular formula; yet differ widely in their properties. They are known as isomers. One type of isomers are those that differ in the way individual atoms are oriented in three-dimensional space.
- **Two molecules could** be exactly the same, except that they are mirror images of each other, like our hands.
- For simplicity, scientists often refer to these molecules as left-handed or right-handed. This simple difference can sometimes have enormous consequences, because it allows the molecules to bind in different locations when they interact with other molecules.
- The end product in a chemical reaction is usually a mixture of left-handed and right-handed molecules.

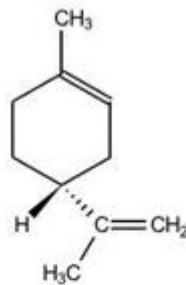
- The **normal chemical reactions** carried out in laboratories are **not selective in this regard**. But nature is. Because the mirror images can have very different properties, natural processes are extremely selective, and precise. They produce either a left-handed or a right-handed molecule.
- List and MacMillan discovered that by using a natural compound like an amino acid as a catalyst, they were obtaining only one specific mirror image of the end-product. This was later named asymmetric catalysis.

Reason for Nobel Prize

- In catalysis, there is an emphasis on not only making reactions faster, but also doing asymmetric or enantioselective reactions - those that produce only one mirror image (enantiomer) of handed molecules.
- As certain biological molecules - amino acids and sugars - only occur as single enantiomers, our bodies have an inherent ability to distinguish between enantiomers.
- This means the same molecule can smell of orange or lemon depending on its handedness, and often only one enantiomer of a drug molecule has a beneficial effect, whereas the other does nothing or can even be harmful.
- Until the start of the 21st century, most enantioselective catalysts were either enzymes or metal compounds.
- Enzymes usually can't be made in the lab but must be isolated from biological sources.
- And while they work very well in the body, they don't do so well under the conditions of synthetic chemistry, being inactivated by heat and solvents.
- Transition metals, on the other hand, are excellent catalysts. But their very nature can make them problematic. Some metals are toxic to people or the environment, so they usually need to be removed from whatever organic compounds have been made with them. And some transition metals are so reactive that they need to be kept away from moisture or air to work, which makes it difficult and costly to use them on large scale.
- This year's laureates showed that even small, simple chiral compounds can catalyse complex reactions - just as well as, or in some cases even better than, enzymes or metals. Organ catalysts are often cheap and easy to produce, and have the potential to make synthetic routes greener.



S limonene (lemons)



R limonene (oranges)



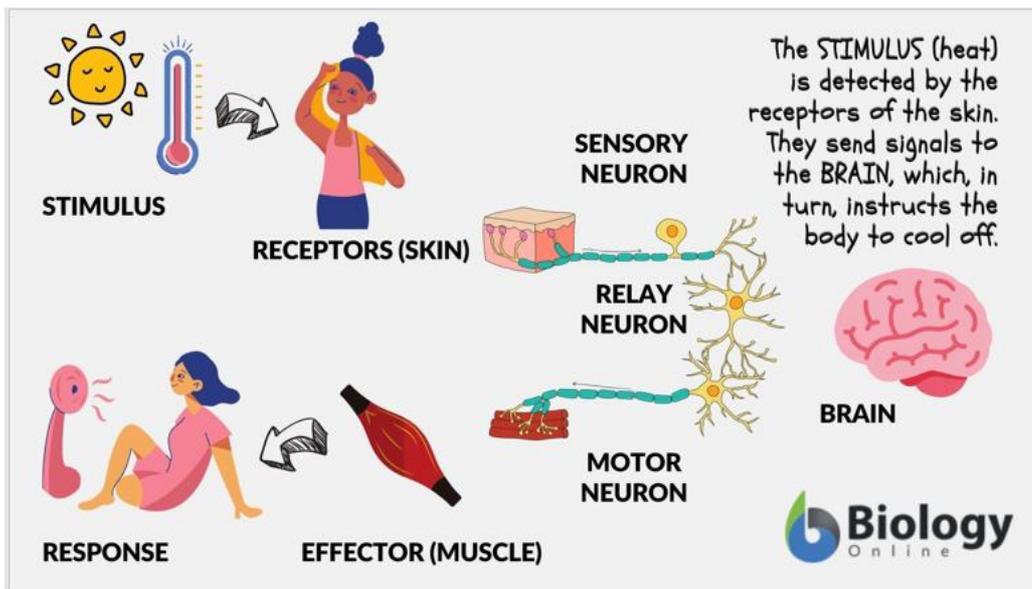
Science & Technology

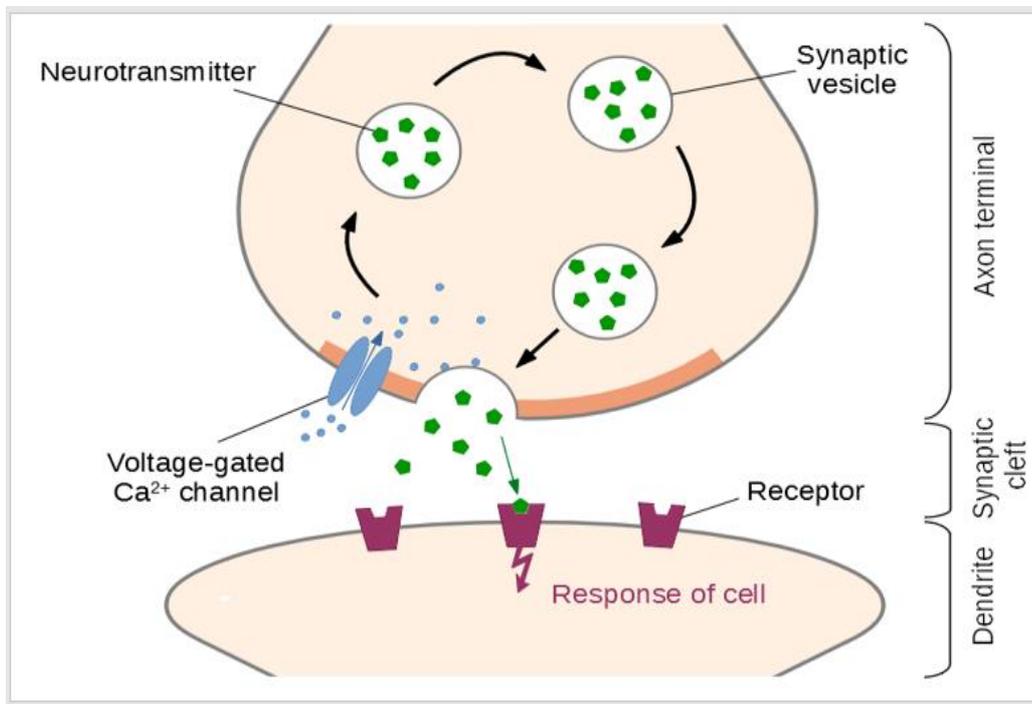
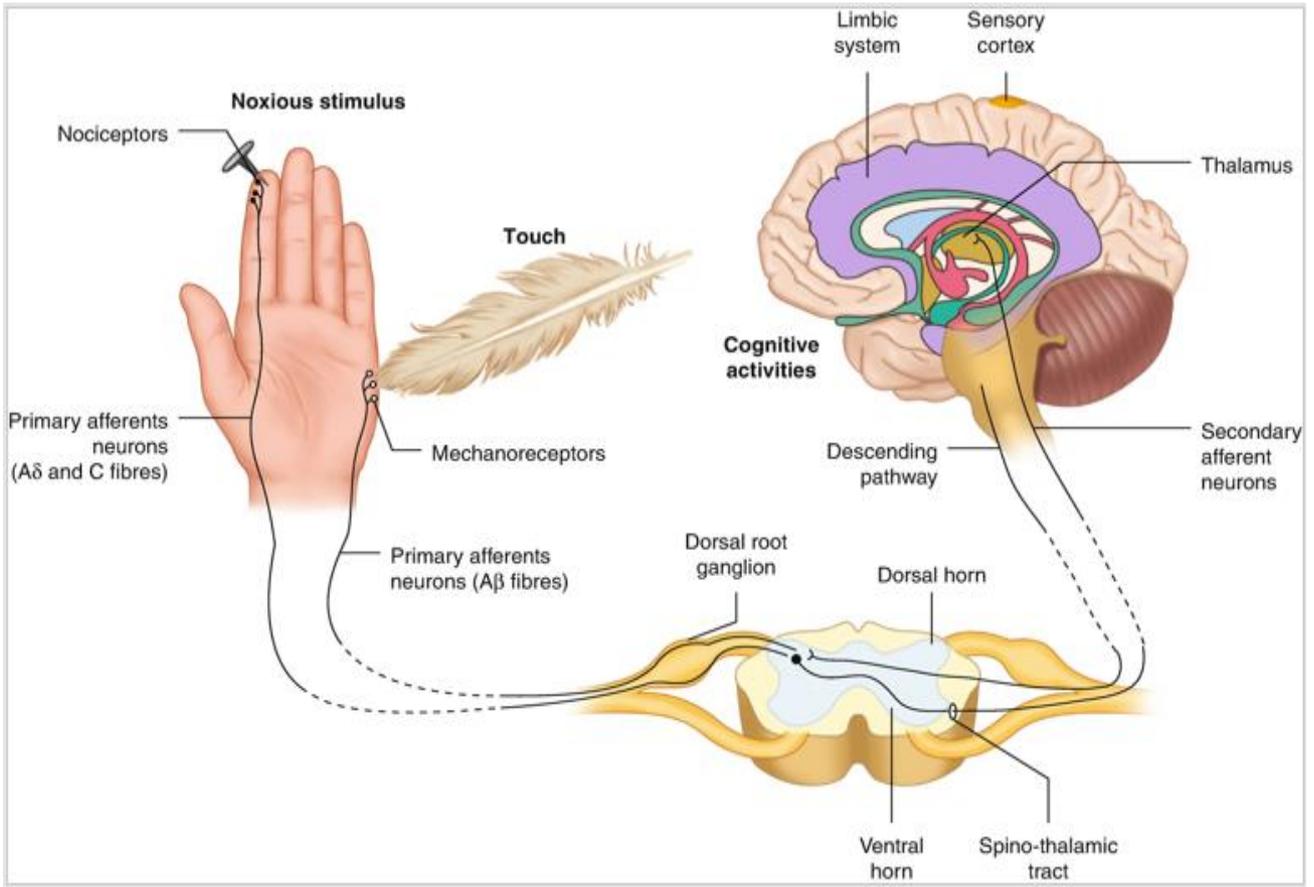
Nobel Prize for Somatosensation

- Two United States-based scientists, **David Julius and Ardem Patapoutian**, have been awarded this year's Nobel Prize for Medicine for their work on **how temperature and mechanical stimuli are converted to electrical impulses in the human nervous system**.
- Julius discovered TRPV1, a heat-sensing receptor, while Patapoutian discovered two mechanosensitive ion channels known as the Piezo channels.

Somatosensation

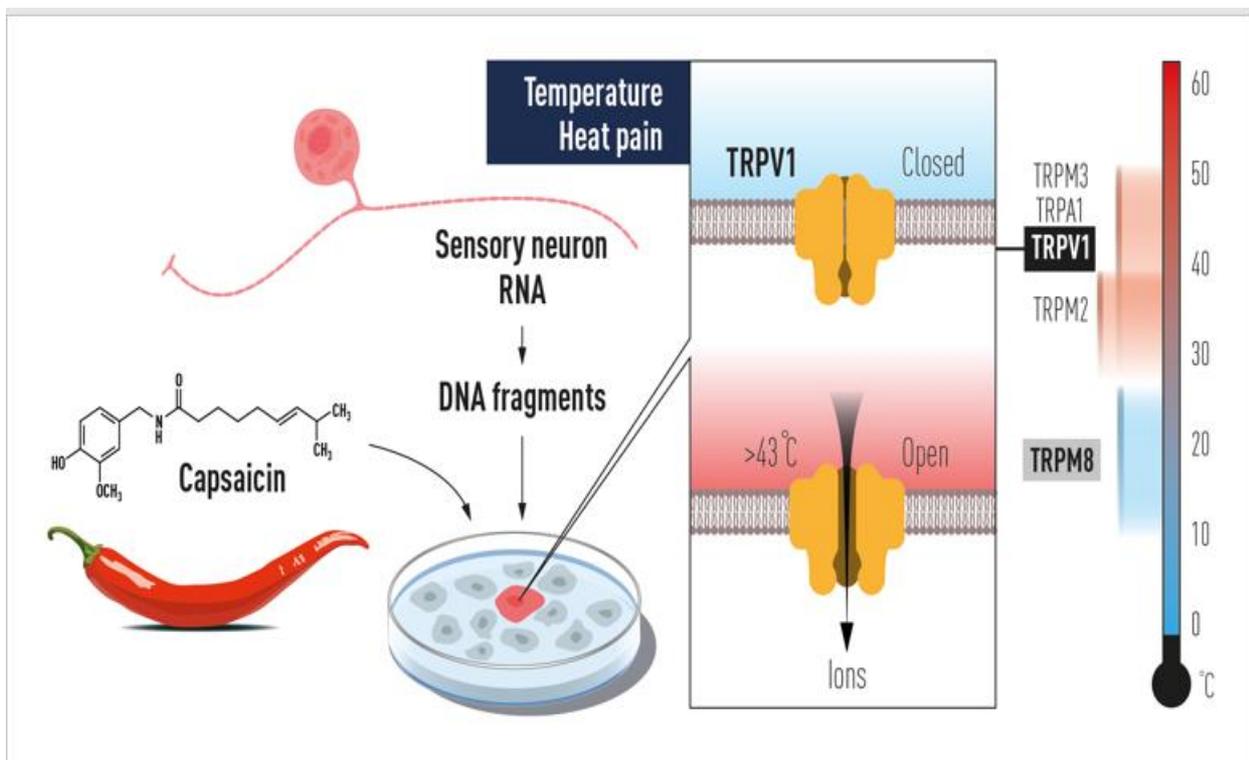
- The ability to feel hot and cold, to recognize an object by touch alone, to respond to pain, to balance on a beam – all fall under the umbrella of somatosensation.
- The somatosensory system also helps to regulate many key internal physiological processes, including blood pressure, respiration, urination and bone remodeling.





TRPV1

- Julius, who is a professor at the University of California in San Francisco, started his project in the 1990s. He worked on the compound Capsaicin, which is found in chilli peppers.
- Julius and his co-workers created a library of millions of **DNA fragments** corresponding to genes that are expressed in the sensory neurons which can react to **pain, heat, and touch**. They hypothesised that the library would include a DNA fragment encoding the protein capable of reacting to capsaicin.
- They expressed individual genes from this collection in cultured cells that normally do not react to capsaicin. The team was **finally able to identify a single gene that was able to make cells capsaicin sensitive**.
- They further researched and found that the **identified gene encoded a novel ion channel protein**.
- This **newly discovered capsaicin receptor was later named TRPV1**. Julius later realised that TRPV1 was a heat-sensing receptor that is activated at temperatures perceived as painful.
- On the other hand, it remained unclear how mechanical stimuli could be converted into our senses of touch and pressure.



Piezo1

- **Ardem Patapoutian** discovered two mechanosensitive ion channels known as the Piezo channels.
- He established that Piezo1 and Piezo2 are ion channels that are directly activated by the exertion of pressure on cell membranes.

