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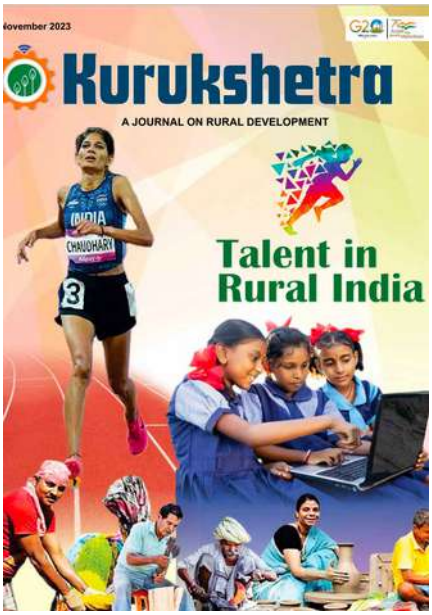

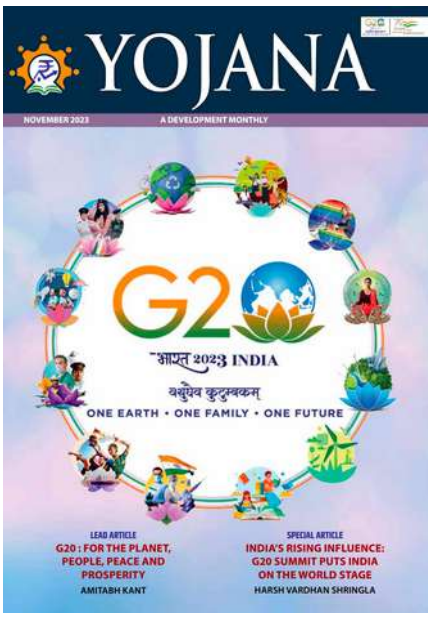

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Contents

1) Sustainability of Rural Enterprises

(GS3: Inclusive Growth and issues arising from it)

Context

- Rural enterprises play a pivotal role in the holistic development of the rural economy and contribute to the economic growth of the nation. However, rural entrepreneurs face several challenges in running and scaling their enterprises which needs to be addressed in a holistic way.

Importance of Rural Entrepreneurship in India

- The amplification and enlargement of rural industries **facilitate self-employment**, and helps in the **maximum utilisation of locally available raw materials and labour.**
- The establishment of a large number of profitable rural enterprises **channelise idle savings into business entities, promotes artistic activities, restricts the migration of rural population** which will abate the asymmetrical growth of cities, increase of slums, social tensions, environmental pollution, etc.

Challenges Faced by Rural Entrepreneurs

- The challenges and concerns faced by rural entrepreneurs in running and scaling their enterprises persist in India.
- The concerns range from the prevalent **societal and gender-based biases** to a **lack of understanding of business, entrepreneurship, and access to the requisite skills** essential to running such enterprises.
- Furthermore, those enterprises that manage to establish themselves in the market and generate some early-stage revenue often face difficulties.
- These range from **inconsistent market linkages, severe competition** from urban markets, a **lack of infrastructural facilities and logistical challenges**, and an **inadequate understanding of the government support mechanisms** available for them.
- Other challenges include the **availability of working capital, the adoption of technology, and the inability to diversify their product range.**
- To address these challenges, there is a need for a **holistic approach** that combines policy support, infrastructure development, and capacity building for rural youth entrepreneurs.

Recovery Roadmap

- These challenges can be addressed by **introduction of some key models**, such as a **marketing cooperative** to promote products manufactured by rural enterprises, thereby **eliminating middlemen.**
- The establishment of **common facility centres**, particularly for production, can also boost rural entrepreneurship.
- **Building business acumen** through capacity-building and training is crucial for entrepreneurial success.
- This, coupled with **access to financial linkages at concessional interest rates, flexible repayment options, and waiving of collateral security,** will spur the growth in this sector.

Role of the Government

- The Government of India's **Start-up Village Entrepreneurship Programme (SVEP)** has been initiated with the purpose of assisting entrepreneurs to establish

their business enterprises in rural India.

- The scheme supports **existing enterprises as well as new enterprises** with their unit establishment at the village level.
- Besides helping rural entrepreneurs to access finance, a cadre of **Community Resource Persons-Enterprise Promotion (CRP-EP)** is also created to provide business support services to rural enterprises.
- It not only aids in the **setting up of enterprises**, but also ensures that **sufficient handholding support** is offered to these enterprises, thereby ensuring their longevity in the market.
- **Rural Self Employment Training Institutes (RSETIs)** provide skill and entrepreneurship development training programmes to the rural unemployed youth.
- The **Ministry of Skill Development and Entrepreneurship (MSDE)** is also executing the **Pradhan Mantri-YUVA initiative** for forming entrepreneurial training and education across the country.
- The **Deendayal Antyodaya Yojana-National Rural Livelihoods Mission (DAY-NRLM) scheme** also supports group women entrepreneurship in rural areas, with market linkages.
- The Government of India, in collaboration with **TATA trusts**, has established a **'Foundation for Development of Rural Value Chain' (FDRVC),** to develop and implement value chain projects through the promotion of large-sized producer enterprises.

Way Forward

- Rural entrepreneurship can also be promoted fundamentally by increasing access to the community and bridging the gaps in certain areas, like providing **mentoring by industry experts**, **establishing incubation centres**, and **conducting ideation workshops,** and **hackathons** to spur innovation and entrepreneurial mindsets.
- The engagement and active participation of **civil society bodies and NGOs** go a long way in institutionalising support mechanisms.

2) Energy Transition in India

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- India stands at a crossroads of development, grappling with the dual challenge of meeting its soaring energy demands while addressing the pressing concerns of climate change and environmental degradation.
- With a population of over 1.4 billion and being the fastest-growing major economy, the need for a **sustainable and secure energy supply** has never been more critical for the country.

Government Measures

- As a signatory to the **Paris Agreement**, India has committed to reducing its carbon emissions and playing its part in combating climate change.
- The **National Action Plan on Climate Change (NAPCC)**, introduced in **2008**, laid the groundwork for the country's sustainable development goals.
- Under the NAPCC, several national missions were launched, **each focusing on a specific sector** that contributes to climate change mitigation and adaptation.
- Among these missions, the launch of the **National Solar Mission** has

been a watershed moment in the renewable energy story of the country. Launched in **2010**, this mission aimed to **promote the deployment of solar energy technologies and reduce the cost of solar power generation.**

- India has recently revised its **target for renewable energy: 500 GW of installed electricity generation capacity through non-fossil fuels by the year 2030.**
- A total of **172 GW of renewable capacity** has been installed by the end of FY 2023. The **share of renewable energy in the generation mix** increased from 17.2% in FY 2014 to **22.5% in FY 2023.**
- Today, India has the **4th highest installed RE capacity** globally. India also ranks **4th** in terms of **global wind and bioenergy installed capacity**, while it ranks **5th** in **solar installed capacity.**
- The Government has also launched the **National Green Hydrogen Mission (NGHM)** in 2023 with a target of **5 MMT (Million Metric Tonne) per annum production capacity by 2030.**
- To improve skilling in the sector, over 32,000 persons have been trained under the **Suryamitra programme**. **Vayumitra** for wind power projects and **Jal-Urjamitra** for small hydro plants have also been launched and training programmes are underway.

Challenges and the Path Ahead

- While India's energy transition has been remarkable, it is not without challenges.
- One of the primary concerns is the **intermittent nature of renewable energy sources** like solar and wind.
- **Balancing electricity supply and demand** becomes complex due to **fluctuations in generation.**
- The **adoption of advanced energy storage technologies**, such as batteries and pumped hydro storage, is essential to store excess energy during peak generation periods and release it during low generation times.
- Moreover, the **integration of renewable energy into the existing grid infrastructure** requires significant investments and upgrades.
- The **development of a robust transmission network** capable of handling intermittent and decentralised energy sources is crucial to maintaining grid stability and reliability.
- In addition to these, following challenges have also been witnessed in the implementation of RE schemes and programmes:
    - **Availability of land**;
    - **Regulatory Issues** such as Compliance of Renewable Purchase Obligation (RPO), Timely adoption of tariff by State Electricity Regulatory Commissions (SERCs), Avoiding levy of additional charges by the States, etc.

Economic and Environmental Implications

- The transition to renewable sources of electricity generation carries numerous economic and environmental implications.
- On the economic front, the growth of the renewable energy sector would **stimulate job creation, spur technological innovation, and attract foreign investment**.
- Further, a decrease in fossil fuel imports would **enhance energy security** and **reduce the vulnerability of the economy to**

global energy market fluctuations.

- Environmentally, the shift away from fossil fuels significantly **reduces carbon emissions, mitigates air pollution, and safeguards public health.**

Conclusion

- As India navigates the complexities of grid integration, energy storage, and infrastructure development, **collaboration between the public and private sectors will be crucial.**
- **International partnerships, technological advancements, and skilled workforce development** will play pivotal roles in shaping the trajectory of the energy transition.
- By embracing renewable sources of electricity generation, India stands poised to lead by example, contributing to the global fight against climate change and inspiring nations around the world to follow suit.

3) G20 for the Planet, People, Peace and Prosperity

(GS2: Bilateral, Regional and Global Groupings and Agreements involving India and/or affecting India's interests)

Context

- India's G20 Presidency is a landmark, successfully championing both the climate and development agendas.
- The **New Delhi Leaders' Declaration** comprising 83 paragraphs was concluded **with no voice of dissent.** This remarkable document signifies a momentous global consensus, underscoring the power of unity in addressing common challenges.

Key Focus Areas of the Declaration

1. Strong, Sustainable, Balanced, and Inclusive Growth:

- The Declaration foregrounds the need for strong, sustainable, balanced, and inclusive growth, with a clear recognition of the **pivotal role of private enterprises, notably MSMEs and startups**, in fostering innovation and employment opportunities.

2. Green Development Pact and Mission LiFE:

- The New Delhi Leaders' Declaration includes the **'Green Development Pact'**–a comprehensive roadmap for the next decade to address the environmental crisis through global cooperation. The Pact has placed major emphasis on **ecosystem restoration.**
- **LiFE (Lifestyle for Environment)** is India's unique offering to the world with the vision to transform India's traditional, sustainable practices, and philosophical ethos into a scalable, **global movement** that changes the way societies consume and produce.

3. The Voice of the Global South:

- India's advocacy to include the **African Union (AU) as a permanent member** of the G20 is a remarkable achievement.
- A pivotal moment in India's G20 presidency was the **'Voice of the Global South Summit.'** This landmark event witnessed the gathering of 125 countries and the participation of 18 Heads of State from the Global South.
- The summit articulated their concerns, aspirations, and priorities on the global stage.

4 Global Digital Public Infrastructure Repository:

- India led the creation of a Global Digital Public Infrastructure Repository, a 'virtual stack' where non-G20 and G20 countries alike can **voluntarily share their open-**

source mechanisms to drive a mutually beneficial ecosystem.
    - Digital Public Infrastructure is described as a **set of shared digital systems** that should be **secure and interoperable**, can be built on open standards and specifications to deliver and provide equitable access to public and/or private services at a societal scale.

5. Circular Economy:

- India launched the **Resource Efficiency and Circular Economy Industry Coalition** as a part of its G20 Presidency.
- The coalition seeks to enhance collaboration among businesses, facilitate experience sharing, capacity building across sectors and value chains, and enhance actions for the circular economy transition.

6. **Responsible AI:**

- The G20 Summit tackled multiple aspects related to Responsible AI (RAI).
- The New Delhi Leaders' Declaration highlights the **significance of harnessing 'AI responsibly for good and for all'.**
- It states that the G20 leaders are committed to leveraging AI for the public good by solving challenges in a **responsible, inclusive, and human-centric manner, while protecting people's rights and safety.**
- The declaration also reaffirms the **leaders' commitment to G20 AI Principles of 2019.** These principles had been adopted at the **2019 Osaka Summit** and underlined the human centred approach of AI.

Conclusion

- In an increasingly divided world, India's people-driven and human-centric G20 Presidency demonstrated the power of collective action.
- The Prime Minister referred to it as a 'people's presidency,' embodying the spirit of the world's largest democracy in shaping a more equitable global future.

4) Wastewater treatment

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- Although India is implementing more effective **modern sewage wastewater treatment technologies**, it must select the ones that best suit its regional requirements.

Wastewater treatment

- **Wastewater treatment** is the process of converting wastewater into an **effluent** that can be either returned to the **water cycle** with minimal environmental impact or **reused.**
- The primary goal of wastewater treatment is to **remove** or **reduce the concentration of various contaminants** present in the wastewater, including **physical, chemical,** and **biological pollutants.**
- The process typically includes several stages to address different types of pollutants:
    - **Preliminary Treatment**: This stage involves the removal of **large objects** and debris from the wastewater through **screening.**
    - **Primary Treatment**: In this phase, solids are separated from the wastewater through **sedimentation**. Gravity settles the heavier particles, forming a sludge at

the bottom of the treatment tank.

- **Secondary Treatment**: This stage is designed to remove the dissolved and suspended biological matter that escapes primary treatment. Here, microorganisms break down organic matter into less harmful substances.
- **Tertiary Treatment**: It involves **advanced filtration techniques, chemical treatment**, or additional **biological processes** to remove remaining contaminants.
- **Disinfection**: The treated water is often disinfected to eliminate harmful pathogens. Common disinfection methods include **chlorination, ultraviolet (UV) irradiation,** and **ozonation.**

Indian Scenario

- According to the **Central pollution control board (CPCB)**, Indian cities currently treat only **28 per cent** of the **72,368 million litres** of sewage they generate every day.
- Most sewage treatment plants in the country rely on outdated technologies that have a **treatment efficiency** of around **65 per cent only**.
- In recent years, several states are opting for newer technologies such as **sequencing batch reactors (SBRS)** and **moving bed biofilm reactors (MBBRS)** that are more resource-efficient and generate **high-quality effluent** with greater reuse potential.

Moving bed biofilm reactors (MBBRS)

- It is a type of wastewater treatment process that takes place in a **bioreactor with plastic carriers** on which **microorganisms** can attach and thrive.
- As wastewater flows through the bioreactor, the microorganisms in the biofilm **metabolise organic matter** and pollutants in the sewage.
- The biofilm is designed to **freely float** within the bioreactor, facilitating the distribution of wastewater and oxygen.
- ***Biofilms*** *are slimy layers of microorganisms that stick to wet surfaces*

Sequencing batch reactors (SBRS)

- SBRS combines **biological treatment** and **sedimentation** within a single bioreactor.
- Each batch cycle begins with the filling up of the reactor with wastewater. This is followed by **aeration** to stimulate microorganisms to metabolise organic matter
- Suspended solids are allowed to settle at the bioreactor's bottom and the treated effluent is either discharged or further processed.

Limitations of new age water treatment plants

- The new age water treatment plants are **energy-intensive** and **expensive** to set up and operate.
- It also requires **skilled human intervention** and **regular maintenance.**
- The wastewater treatment plants also generate a **significant amount of sludge**, requiring proper management and disposal strategies.

Conclusion

- Wastewater treatment is a crucial aspect of environmental protection, as it helps prevent water pollution and ensures the responsible and sustainable management of water resources.

5) Homegrown benefit

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- A shift from **exotic** and **crossbred cattle** to **indigenous breeds** that are better adapted to changing climate and resistant to diseases will help **India's dairy sector** stay **profitable** and **sustainable.**

Indigenous cattle

- **India** is home to several **indigenous** or **native cattle breeds** that have adapted to the country's **diverse climatic conditions** and are well-suited to **local agricultural practices.**
- Some prominent indigenous cattle breeds in India include,
    - **Gir**: These cattle are primarily raised for milk production. They have a distinctive hump and are well-adapted to tropical climates.
    - **Sahiwal**: They are known for their heat tolerance and resistance to diseases. They are predominantly used for milk production and are well-suited to the arid and semi-arid regions of India.
    - **Red Sindhi**: Originating from the Sindh region, Red Sindhi cattle are valued for their adaptability to various climates, and good milk-producing qualities.
    - **Tharparkar**: Well-adapted to arid environments, Tharparkar cattle are primarily used for milk and drought power.

Indian Scenario

- India is the **world leader** in **milk production** and contributes **24 percent** to global output.
- Since 1970, the Union government has promoted **high-yielding breeds**, such as **Holstein-Friesian, Jersey, Brown Swiss** and **Red Dane**.
- An analysis of **Livestock Census data** from 2007, 2012 and 2019 shows that the **number of indigenous and nondescript cows** have increased by **10 percent,** as against a **76 per cent rise** in **exotic** or crossbreeds.

Advantages offered by Native cattle

- Native animals exhibit **heat tolerance, disease resistance** and **ability to thrive in extreme climates.**
- They have **smaller bodies, more sweat glands**, and **well-developed dewlaps** (a fold of loose skin hanging from the neck or throat), which help **dissipate heat more effectively.**
- Indigenous breeds are renowned for their **resistance to illnesses** including the **vector-borne trypanosomiasis,** and **tick-borne babesiosis** and **theileriosis.**
- Indigenous cattle account for **fewer emissions** due to their smaller size and efficient metabolism. They aid in reducing the **carbon footprint.**

Threats faced by indigenous cattle

- **Crossbreeding programs** that introduce exotic breeds for increased milk production can lead to **dilution** of **indigenous genetic traits.**
- **Urbanization, agricultural intensification, and changes in land use patterns** can result in the loss of traditional grazing lands and habitats for native cattle. This can limit their ability to exhibit natural behaviors and access suitable forage.
- With the adoption of **modern agricultural practices** and **machinery**, **traditional roles of**

native cattle, such as draught power, have diminished. This can lead to neglect and abandonment of these breeds, particularly if they are perceived as less productive.
- There exists a **lack of institutional support** and policies to promote the conservation and sustainable use of native cattle breeds.

National Initiatives for the promotion of native cattle breeds

- **Rashtriya Gokul Mission**: It is a flagship program under the **National Programme for Bovine Breeding and Dairy Development.** The mission focuses on the development and conservation of indigenous breeds, with the objective of enhancing milk productivity and improving the livelihoods of farmers. It includes the establishment of **Gokul Grams (livestock centers)** for the conservation and development of indigenous breeds.
- **National Mission on Bovine Productivity**: This mission was launched in 2016 to enhance milk production and productivity in indigenous cattle through various interventions such as **breed improvement, veterinary healthcare, nutrition management,** and **promoting best management practices.**
- **National Bovine Genomic Centre for Indigenous Breeds**: It is established under the **Indian Council of Agricultural Research (ICAR)**, and focuses on **genomic research** and **conservation of indigenous cattle breeds**. It aims to use advanced genomic tools for breed improvement and conservation.
- **Pashu Kisan Credit Card (PKCC):** This initiative provides farmers with a **credit card** for meeting the needs of their animals, including **purchasing feed, veterinary care**, and other inputs.

Conclusion

- The conservation of indigenous cattle is essential for maintaining genetic diversity within the global cattle population, ensuring the resilience of livestock in the face of environmental challenges and climate change.

6) Amazonian Drought

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- The **prolonged drought** in the **Amazon** indicates that the rainforest is edging closer to a **tipping point** from which recovery may become irreversible.
    - *The term "tipping point" refers to a critical threshold or turning point at which a situation undergoes a significant and often irreversible change.*

Drought

- According to the **United Nations Convention to Combat Desertification (UNCCD)**, the **world loses 12 million hectares of land every year to drought and desertification.**
- A **drought** is defined as a **deficiency of precipitation** over an extended period of time, usually a season or more resulting in water shortage.
- The failure of seasonal rain, long dry spells and gradual drying up of moisture in land with effects on crops are usual stages that lead to a **drought emergency.**

Amazon Rainforests

- It is the **largest tropical rainforest** in the world, spanning approximately 6.7 million square kilometers.

- These forests span across several countries in South America such as **Brazil, Peru, Colombia, Venezuela, Ecuador, Bolivia, Guyana, Suriname,** and **French Guiana.**
- The Amazon has a **tropical climate with high temperatures and abundant rainfall.**
- The **Amazon River**, the **second-longest river in the world after the Nile,** flows through the rainforest.
- It is home to around **390 billion individual trees** representing about **16,000 different species**. The diversity of flora and fauna in the Amazon is unparalleled, with new species continuously being discovered.
- The Amazon rainforest is often referred to as the "**lungs of the Earth**" because of its role in producing oxygen and regulating the global carbon cycle. The health of the Amazon has significant implications for the overall health of the planet.

Causes for the Amazonian drought

- **El Niño phenomenon**
  - It has a direct influence on the **Amazon drought**. It results in **abnormal warming** of the surface waters of the Pacific Ocean, which subsequently affects **rainfall patterns.**
  - In the Amazon region, El Niño leads to **decreased humidity** and **reduced rainfall**, exacerbating drought conditions.
- **High water temperatures in North Atlantic ocean**
  - Warm sea surface temperatures in the tropical North Atlantic causes a change in the position of **Inter-Tropical Convergence Zone**
    - *ITCZ is a region near the equator where the trade winds from the Northern and Southern Hemispheres meet.*
  - Here when the ITCZ rain band migrates northward because of high sea surface temperature the Amazon region gets devoid of rainfall.
- **Deforestation**
  - **Deforestation** for **mining** and for **palm oil plantations** has increased in the Amazonian Region.
  - A lack of green vegetation has reduced **evapotranspiration**, leading to increased possibilities for drought.
    - ***Evapotranspiration*** *is the loss of water vapour to the atmosphere through soil evaporation and water transpiration of plants.*
- **Hydroelectric projects**
  - The **Madeira River**, the **largest tributary** in the Amazon has been drastically affected and transformed by **hydroelectric dams.**
  - This was due to the drastic alteration of the river's natural flow caused by the **damming of water** for power generation.
  - The reduction in the volume of water in the Madeira River has also contributed to prolonged periods of drought.

Implications of the drought

- The drying up of several water bodies has been taking place throughout the Amazonian region. **The Rio Negro**, one of the **world's largest rivers** by discharge levels, has fallen to a record low level of 13.59 metres.
- **Wildfires** have spread to many reserved indigenous territories, destroying flora and fauna.
- A **large mortality of Boto or pink river dolphins** has been taking place across the region. These animal carcasses have been contaminating water bodies.
- Some communities have reported **outbreaks of diseases** such as diarrhoea and skin infections due to the contaminated water.

Conclusion

- Beyond the tipping point, it is said that the Amazon region would transform from a lush green forest into a drier open savanna, releasing a **large amount of stored carbon**, which would, in turn, exacerbate **global warming.**
- Therefore, there is an urgent need to curb deforestation and greenhouse gas emissions to protect the Amazon.

7) Early warning systems

(GS3: Disaster and Disaster Management)

Context

- Early warning systems for extreme weather events are becoming more challenging due to temperature rise and the associated changes in the climate

Early warning systems

- Early warning system is an **adaptive measure** for **climate change**, using integrated communication systems to help communities prepare for hazardous climate-related events.

Components of early warning systems

- **Monitoring and Detection**: IIt refers to use of devices to monitor various parameters such as seismic activity, weather conditions, river levels, temperature, and other relevant indicators.
- **Data Analysis and Forecasting**: Centralized facilities process and analyze the data collected from monitoring instruments and satellites.
- **Meteorological and Environmental Models**: Computer models help forecast the potential impact of natural events based on historical data and current conditions.
- **Communication Systems**:Robust communication infrastructure is essential to transmit alerts and warnings quickly and efficiently. This is done through SMS, mobile apps, and social media.
- **Warning Dissemination**: Broadcasting alerts through radio, television, and online media channels ensures widespread dissemination.
- **Response Coordination**: Centralized command centers coordinate response efforts, ensuring a unified and organized reaction to the threat.
- **Feedback and Evaluation**: Assessing the effectiveness of early warnings by evaluating the response and outcome of the alerted population.
- **Government and Institutional Involvement**: Collaboration between government agencies, NGOs, and international organizations to enhance the efficiency of early warning efforts.

Challenges faced by early warning systems in a warming world

- The existing early warning systems are unable to **accurately predict**

and **forecast** the changes in **natural hazards effectively**.

- Many early warning systems, especially in developing countries, face **resource constraints**. This includes funding for infrastructure, technology, and human resources.
- Less than half of the Least Developed Countries and only one-third of Small Island Developing States have a **multi-hazard early warning system.** Multi-hazard early warning systems address several hazards that may occur alone, simultaneously, or cascadingly.
- Overreliance on technology, without sufficient backup systems or alternative communication channels, can make early warning systems **vulnerable to technical failures, cyberattacks,** or **power outages.**

Need of the hour

- To make accurate predictions of natural hazards, **data** from all the countries in a region needs to be brought together and **fed** into **weather models.**
- Developing countries also need better **capacity-building** and **funding** for better **data collection.**
- Success of forecast models depends on the amount and diversity of **observational data** on **rainfall, temperatures** and other necessary parameters, resolution of the model itself, and how well it is able to represent natural phenomena through a process of modelling known as **physical parametrisation.**
- For addressing transboundary hazards, effective early warning should incorporate **international cooperation** and **data sharing.**

Conclusion

- **Artificial intelligence** and **machine learning** can fill the technology gaps on the reliability of weather forecasts and early warning.

8) Methane Emissions

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- **High-income nations** across the world seem to have chosen agriculture as a priority sector to enforce emissions cuts for meeting their national climate targets.

Methane

- Methane is the **simplest hydrocarbon, consisting of one carbon atom and four hydrogen atoms (CH4).**
- It is **flammable**, and is used as a **fuel** worldwide.
- It is nearly **80-85 times** more potent than **carbon dioxide** in terms of its **global warming capacity.**
- The common **sources of methane are** agricultural activities, **oil** and **natural gas systems**, **coal mining** and **wastes.**

Findings

- **Methane** is the second most abundant greenhouse gas (GHG) after carbon dioxide (CO2), accounting for 20 per cent of global emissions.
- About **32 per cent** of global anthropogenic methane come from microbial processes that occur during the enteric fermentation of ruminant livestock and manure management systems.
- **Oil and gas operations** contribute to about **63 per cent** of methane emissions.
- **Less than 2 percent** of **climate finance** is used to develop methane-mitigation solutions.

Emissions from Agriculture

- **Methane** (from livestock belching, flatulence and dung) and **nitrous oxide** (from nitrogen fertilisers) are the two main greenhouse gases (GHGs) from the agriculture sector.
- As per **US Environmental Protection Agency**, methane and nitrous oxide account for 16% and 6% of global GHGs.
- **Paddy rice cultivation** in which flooded fields prevent oxygen from penetrating the soil, creating ideal conditions for the growth of methane-emitting bacteria.

Global initiatives

- **Methane Alert and Response System (MARS)** will integrate data from many existing and future satellites that can detect methane emission events anywhere in the world, and send out notifications to the relevant stakeholders to act on it.
- At the **Glasgow climate conference (UNFCCC COP 26)** in **2021,** nearly **100 countries** had come together in a **voluntary pledge,** referred to as the **Global Methane Pledge,** to cut methane emissions by **at least 30%** by **2030** from the **2020** levels.
- **Global Methane Initiative** is an **international public-private partnership** focused on reducing barriers to the recovery and use of methane as a clean energy source.

National initiatives

- **Indian Council of Agricultural Research (ICAR)** has developed an **anti-methanogenic feed supplement 'Harit Dhara'** which can cut down cattle methane emissions by **17-20%** and result in higher **milk production.**
- **National Action Plan on Climate Change (NAPCC)** was launched in **2008** and aimed at creating awareness among the representatives of the **public, government, scientists, industry,** and the **communities** on the **threat** posed by **climate change** and the **steps** to counter it.
- **India** shifted from **Bharat Stage-IV** to **Bharat Stage-VI** emission norms.

Way Forward

- There is a need for more **ambitious efforts** to reduce **methane emissions** to achieve the **Paris Agreement target** of restricting **global warming** to **1.5 degrees Celsius** above **pre-industrial levels.**
- Further, **behavioral changes** including reducing **food waste ,** improving **livestock management** and adopting **healthy diets** can help lower **methane emissions**

9) BT's takedown

(GS3: Science and Technology-Developments and their Applications and Effects in Everyday Life)

Context

- Indian farmers have faced consistent losses of Bt cotton crops due to pink bollworm attacks.

Bt cotton

- **GM crops** are derived from plants whose genes are artificially modified, generally by inserting genetic material from another organism, to give it new properties, such as **improved nutritional value, increased yield, resistance to disease or drought,** etc

- **Bt cotton** has been genetically modified (GM) by inserting one or more genes from **Bacillus thuringiensis**, a soil bacterium.
- The insertion of B. thuringiensis genes causes cotton plant cells to produce **crystal insecticidal proteins** known as **Cryproteins.**
- These proteins are effective in killing some of the most damaging **cotton caterpillar pests**, such as **tobacco budworm** and **bollworm larvae.**

Pink bollworm

- **The pink bollworm** (Pectinophora gossypiella) is a significant agricultural pest that primarily infests **cotton crops.**
- It is named for the pink color of its larval or caterpillar stage.
- Unlike the American bollworm which feeds on multiple plants, pink bollworm is **monophagous**, meaning it feeds only on cotton crops.
- The pink bollworm has developed resistance to several **chemical insecticides** used for its control. This resistance has posed challenges for traditional pest management strategies.

Major concerns over Pink bollworm

- Indian farmers have faced **consistent losses** of Bt cotton crops due to pink bollworm attacks since the mid-2000s, when scientists found that the insect had become resistant to the **genetically modified variety** of cotton.
- Bacillus thuringiensis (Bt) cotton, or **Bollgard-I**, was introduced to protect the crop against all three species of bollworms (American, spotted and pink bollworms) as it was encoded with Cry1Ac toxin.
- In 2009-10, scientists confirmed pink bollworm's resistance to Cry1Ac gene in four districts of Gujarat.
- In 2017-18, widespread pink bollworm infestation was reported in **Maharashtra** and the southern states.
- By 2023, resistant populations of pink bollworm to Bt cotton were established in the **North Zone including north Rajasthan districts.**

Causes for increased resistance in pink bollworms

- **Early sowing of cotton**, done by farmers coincides with the time when the worm comes out of winter hibernation (known as diapause stage).
- The cotton plants are at bud or flowering stage, during which the pink bollworm's search for food begins. Therefore, it starts feeding on bolls during the larval stage.
- Early sowing also means the pest has access to food for a longer time. This leads to more **breeding** and **population growth.**
- **The Cry gene**, which Bt cotton is encoded with to prevent pink bollworm from attacking the seeds, wears off during the end of the **cotton plant's life cycle**. If these pests survive these plants after exposure to small quantities of these toxins, they develop resistance to it.
- Farmers have not been following the advise of **planting indigenous, hybrid varieties of cotton alongside Bt cotton** to prevent the pests from developing resistance. This is important as the cross breed of pests from different varieties of plants would have helped in preventing the development of resistance.
- Even **pesticides** are of limited use in the case of pink bollworms as the pest is **protected inside** the **bolls** and damages the crop from the inside.

Conclusion

- Efforts to control the pink bollworm involve a combination of biological, chemical, and cultural strategies. **Sustainable and integrated pest management practices** are essential to minimize the impact of this pest on cotton production and protect the livelihoods of cotton farmers.

10) Biosphere reserves are evolving as pockets of hope

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- On this **second anniversary of World Biosphere Reserve Day,** UNESCO in partnership with the Ministry of Environment, Forests and Climate Change and the National Centre for Sustainable Coastal Management, concluded the **10th South and Central Asian Biosphere Reserve Network Meeting (SACAM)** in Chennai, India (November 1-3).
- With the **theme "Ridge to Reef,"** the SACAM provided a platform for exchanging knowledge and fostering collaborations in the realm of sustainable environmental practices in the South and Central Asia Region.

World Biosphere Day

- **World Biosphere Reserve Day** is celebrated on **November 3 each year** to raise awareness of the importance of biosphere reserves and to promote their conservation and sustainable use.

What are Biosphere Reserves?

- Biosphere reserves are designated areas that aim to balance the conservation of biodiversity, sustainable development, and scientific research.
- They are part of the **Man and the Biosphere (MAB) program**, which is run by the **United Nations Educational, Scientific and Cultural Organization (UNESCO).**
    - The UNESCO Man and the Biosphere (MAB) programme enhances the human-environment relationship through combining natural and social sciences to improve livelihoods, safeguard ecosystems, and promote sustainable economic development.
- **Biosphere reserves are also supported by other United Nations agencies,** for example the **United Nations Development Programme, the United Nations Environment Programme**, as well as the International Union for Conservation of Nature.
- The primary goals of biosphere reserves are to promote the sustainable use of natural resources, protect ecosystems, and foster research and education.
- Biosphere reserves typically consist of three interconnected zones.
    - **Core Area:** The core area is the central, undisturbed portion where conservation efforts are focused. It is meant to protect and preserve the most sensitive and valuable ecosystems, plants, and wildlife.
    - **Buffer Zone:** The buffer zone surrounds the core area and acts as a transitional area. Here, human activities are managed to promote sustainability and minimize negative impacts on the core area. Sustainable resource use and ecotourism are

often encouraged in this zone.
    - **Transition Area:** The transition area, which surrounds both the core and buffer zones, allows for more intensive human activities and development. The goal is to foster sustainable development, maintain cultural heritage, and engage local communities in conservation efforts.
- According to UNESCO, there are currently **748 biosphere reserves across 134 countries**, including 22 transboundary sites, enhancing the friendly cooperation between neighboring countries.
- They impact the lives of more than 250 million people in 134 countries; 12 sites can be found in India alone.

Significance of biosphere reserves

Do you know?
In the Island of Principe Biosphere Reserve, Sao Tome and Principe in Africa, schoolchildren have been equipped with stainless steel bottles for drinking water, so the daily production and consumption of single-use plastic bottles can be completely avoided.

- **Pockets of hope in the face of the climate crisis:**
    - In recent years, biosphere reserves have become crucial in our fight against climate change, as these areas are home to many of the world's carbon sinks helping to absorb carbon dioxide from the atmosphere.
    - **Carbon sinks,** like forests and the ocean, **provide solutions in implementing adaptation strategies** to fight climate change.
- They are hidden oases, protecting biodiversity, reducing pollution, and enhancing climate resilience.
- They are living jewels of land, coastal and marine ecosystems, scattered across the globe, where nature and humans come together creating a symphony of life.
- They are **home to a wide variety of ecosystems** from tropical rainforests to alpine deserts, and thereby provide home to countless unique and endangered plants and animal species.
- In addition to playing a vital role in the protection of biodiversity and ensuring the sustainable use of natural resources, they also **provide opportunities for sustainable economic development.**

Conservation efforts at the local level

- There have been significant advancements in the conservation of biosphere reserves on the local level.
    - For example, in the **Sundarban Biosphere Reserve** in India, **local communities are working together to manage mangrove forests** and protect the biodiversity of the region.
    - In the **Gulf of Mannar Biosphere Reserve** in India, local communities, including women, are contributing towards conservation efforts by forming self-help groups, while the youth are getting engaged in eco-tourism.
    - The Gulf of Mannar Biosphere Reserve Trust has also introduced the concept of **'plastic checkpoints'.** Community members check

all vehicles and tourists for plastic waste, which is collected, recycled and used for the construction of roads. This was recently recognised with the UNESCO Michel Batisse Award for Biosphere Reserve Management 2023.

UNESCO Michel Batisse Award
• The award was instituted in 2004 following a decision of the International Coordinating Council of the Man and the Biosphere (MAB) Programme of UNESCO. • The $12,000 award is given once every two years in memory of Dr Michel Batisse for outstanding achievement in management of biosphere reserves across the globe.

Threats

- **Deforestation, invasive species and land use changes** such as mining, increasing urbanization and constant growth of the world population leading to increasing exploitation by humans remains as threats to the biosphere reserves.

Conclusion

- There is a need for continued efforts to conserve biosphere reserves and promote their sustainable use.

11) Enhancing representation, for a just electoral system

(GS2: Comparison of the Indian Constitutional Scheme with that of Other Countries)

Context

- This article discusses the disproportionate electoral representation prevailing in India and how delimitation can bring in proportionality along with the way forward for a just electoral system. It draws comparison with the U.S in the process.

India vs. the U.S.

India	The U.S.
An Indian Member of Parliament (MP) is said to represent 2.5 million citizens, on average.	A U.S. House of Representatives member typically represents approximately 7,00,000 citizens.
India is a **heterogeneous** country with a **multiparty political system** across States.	The U.S is a **homogeneous** country with a **bi-party political system**, where the same parties compete across all States.
India's political system is riven with malapportionment, with legislative weight being skewed towards the citizens of select States empowering select political outfits over others.	It has a political system with each State given two senators in the U.S. Senate, enabling a block on legislation.

Current state of electoral representation in India

- In this year so far, India had around **4,126 Members of the Legislative Assembly, 543 Lok Sabha MPs and 245 Rajya Sabha MPs.**
- There are far too few parliamentarians/Assembly

members responsible for citizen welfare in India.

- While India does have innumerable grassroots politicians, 1,000-plus municipal councils/corporations with between 50 to 100 wards and approximately 2,38,000 panchayats with between five to 30 members on average at the national/State level, there is a **clear deficit in terms of their adequate representation** in order to raise critical issues and enable law-making.

Delimitation- a potential solution to restore proportionality

About Delimitation
• Delimitation is the **act of redrawing boundaries of Lok Sabha and state Assembly seats to represent changes in population.** • The main objective of delimitation is to provide **equal representation to equal segments of a population**. It also aims at a fair division of geographical areas so that one political party doesn't have an advantage over others in an election. • In India, delimitation is carried out by an independent **Delimitation Commission.**

- In India, Delimitation Commissions have been **constituted 4 times** – 1952, 1963, 1973 and 2002 under the Acts of 1952, 1962, 1972 and 2002.
- There was **no delimitation after the 1981 and 1991 Censuses** because the union government had **suspended delimitation in 1976 until after the 2001 census** so that **states' family planning programs would not affect their political representation** in the Lok Sabha.
- In February 2002, the **84th Amendment Act of the Constitution** was introduced, which froze the number of Lok Sabha seats until the first Census after 2026 (i.e., 2031).
- The fear of losing meaningful political representation was especially great in the **southern states** which had greater success in controlling populations.
- So, the last delimitation exercise was based on the 2001 Census and **only readjusted boundaries of existing Lok Sabha and Assembly seats and reworked the number of reserved seats** (without changing the number of seats in Lok Sabha and Assemblies).
- With the 2021 Census delayed (now likely to be conducted in 2024, with results potentially published by 2026), there is a window to conduct delimitation earlier. However, **unleashing delimitation will have its consequences.**

Consequences of delimitation

- Delimitation, in its historical form, would **engender a bias towards a Hindi-speaking northern population** while **enabling select national parties to rise to power.**
- States which have performed well in reducing their population growth, such as Tamil Nadu and Kerala, may be punished.
    - Assuming the number of parliamentary seats goes up to say 753 seats, states such as Tamil Nadu, Andhra Pradesh, Telangana and Kerala might see an increase in seats of about 6%, with Karnataka potentially seeing an 11% rise.
    - Meanwhile, northern states such as Uttar Pradesh, Bihar, Madhya Pradesh, and

Rajasthan would see their seats rise by 63%.

How to minimize the deleterious consequences of delimitation?

- **Increase the number of seats in Parliament** significantly (at least around 848 seats to avoid any State losing seats), which can help to enhance democratic representation ratios.
- Delimitation should not be driven only by factors based on population; instead **geographical determinism, economic productivity, linguistic history, and a sense of fairness** should also play a part.

Way forward for a just electoral system

- **Promote federalism:** Federalism needs to be promoted and States to be given a better voice and a platform to represent their interests.
    - Constitutional reform can be pursued to **give each state the same number of Rajya Sabha MPs.**
    - **Direct elections for Rajya Sabha MPs** should be promoted while ensuring that a domicile requirement is added.
    - **Proportional representation** can also be considered, especially for the Lok Sabha and State Assembly elections by considering examples of Australia and France.
- **Have more states:** There is potential for India to have more States (moving up from 29 to say 50 or even 75 States).
    - For example, a State such as **Uttar Pradesh, is simply too big to be governed** well as a single unit. Also a concern about North Indian or large States dominating the polity would be alleviated if we had more and smaller-sized States.
    - A **New State Reorganisation Commission** may be set up after the next election to evaluate the socio-economic and administrative viability of select to-be States (for example, Bundelkhand, Gorkhaland, Jammu, Karu Nadu, Kongu Nadu, Mithila, Saurashtra, Tulu Nadu and Vidarbha).
- **Enhanced local democratic representation:** Every Census town may have a fixed-tenure mayor elected in direct elections, who must also be empowered, with decision-making ability over 18 critical functions — for example, urban planning, water supply, fire, land use regulations and slum improvement), as outlined by the Constitution (74th Amendment) Act.

12) For clean air

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- This article explains how cities with worse air than Delhi fixed the problem and what needs to be done by India to ensure clean air.

Impact of Air Pollution

- **Health impact:** Air pollution is the **fifth-largest cause of death** in India — it led to **premature deaths of 1.6 million Indians in 2019.**
    - Despite their limited contribution to emissions that lead to severe air days across the country, rural Indians make up two-thirds

of the air pollution-led premature deaths.

- **Economic impact:** Poor air amounts to about **Rs 7 lakh crore of economic loss annually.**

Why tackling air pollution remains a challenge?

- Air pollution is a systems problem that **cuts across state and regional boundaries**, spanning rural and urban areas.
- Associated with **multiple sources of emissions** and is linked to interconnected economic factors and interests.
- India's responses to the crisis are often **fragmented**, **addressing symptoms and not root causes.**
    - For example, a few smog towers, some dust suppression by spraying roads, knee-jerk construction bans, haphazard odd-even restrictions on traffic, and shutting down schools cannot address the problem of Air pollution.

What needs to be done?

1. **Address root causes** across a fractured system of governance.
2. There is a need to acknowledge that this is a **human-induced problem.**
3. Realize that the **most vulnerable** — like children and older people, rural communities, and the urban poor have **contributed the least to the problem.**
4. **Learn lessons from other countries** that have successfully tackled this challenge, and act on evidence-based options to address it.
5. Focus on changing our production, transportation, consumption and waste management systems to address the challenge.

a. For instance, apart from Beijing, Mexico City, and even London, Delhi's poor air also improved following a **fuel switch from diesel to CNG in public transport** in the 2000s.

Coordinated interventions needed

- An **integrated approach to limit emissions and reduce exposure** across the value chain from production to consumption to recycling of goods and delivery of services is needed.
    - This means limiting emissions from coal-fired power plants, polluting industries and brick kilns as well as limiting wood, cow dung and garbage burning for cooking.
    - Also there is a **need to limit crop residue burning** by implementing known solutions like shifting to less water-intensive crops, altering irrigation arrangements, timing, harvesting, baling practices and building a wider year-round market for straw.
- **Increase the availability of affordable green urban public transport** that enables universal last-mile connectivity like in Singapore, Hong Kong etc., This can be achieved through
    - Shifting metro systems in India to renewable power.
    - Expanding metro ridership, and improving and electrifying viable bus services.
- There is a need for **widespread electrification of buildings, vehicles and production processes**, where possible.
    - Fuel switching to renewables can both curb pollution and meet climate goals.

- **Adopt a regional or airshed approach to address pollution sources** and impacts across an entire region rather than individual cities and towns.
    - This approach was successfully deployed in Los Angeles, Mexico City and many mega-urban regions in China.
- **End-to-end construction and waste management** is pivotal to reducing tonnes of dust and waste released in the air and water bodies.
    - Recycling concrete, brick and stone from existing buildings will also limit the mining of our rivers.
- Enabling **strong legislation and enforcement of regulations** are necessary throughout the year, not just around Diwali.
- There must be **wide-scale citizen mobilization for awareness and education,** which can influence lifestyle choices over decades.
- The precedent set by the Fifteenth Finance Commission by **investing in health and solid waste management should extend to financing of climate change and air pollution reduction interventions** in the Sixteenth Finance Commission.
- There is a **need to deploy the best science and technology available to establish real-time monitoring systems** that can even provide advanced weekly forecasts.
- Expanding and improving the **System of Air Quality Forecasting and Research (SAFAR)** network can help us make rational decisions on alerts, interventions and investments.

What is SAFAR?

- The **Ministry of Earth Sciences (MoES)** has introduced a major national initiative, "**System of Air Quality and Weather Forecasting and Research**" known as "SAFAR" for greater metropolitan cities of India.
- The aim is to provide **location specific information on air quality** in near real time and its forecast 1-3 days in advance for the first time in India.
- It has been combined with the **early warning system on weather parameters.**
- The SAFAR system is developed by **Indian Institute of Tropical Meteorology, Pune,** along with ESSO partner institutions namely India Meteorological Department (IMD) and National Centre for Medium Range Weather Forecasting (NCMRWF).

Conclusion

- Instead of piecemeal approaches, with coordinated actions, we can address not only air pollution but also our urban climate and health goals together.

13) The price of persistent federal frictions

(GS2: Functions and Responsibilities of the Union and the States, Issues and Challenges Pertaining to the Federal Structure, Devolution of Powers and Finances up to Local Levels and Challenges Therein)

Context

- In recent years, the frequency and intensity of disputes between the Union government and the States have increased and assumed the character of 'persistent frictions' in the federal system. This article analyzes the friction and the potential consequences of the same.

Frictions between the Centre and State:

- **Resource sharing:** State governments depend on the Centre for their revenue receipts. Issues like the Goods and Services Tax (GST) implementation and fiscal transfers remain contentious.
- **Homogenisation of social sector policies:** Standardization of policies in health, education, and social welfare may not always account for regional disparities and specific needs of diverse states.
- **Functioning of regulatory institutions and the powers of central agencies:** The apex regulatory bodies instead of overseeing have often attempted to increase their influence and push States in directions that are amenable to the Centre.

Potential Consequences

- **Impediment to Development:** Disputes can stall crucial projects, economic growth, and delivery of public services, ultimately impacting citizens.
- **Eroding Trust:** Constant friction can weaken the cooperative spirit essential for a healthy federal system, leading to distrust and inefficiency.

Economic Consequences in particular

- **Fiscal competition:** Results in a peculiar form of **fiscal competition** between the Centre and States and States with other states.
    - Eg: **Welfare provisioning:** The Centre with enhanced fiscal space has more spending power, while States' revenues, especially non-tax revenues, remain flat.
- **Inefficiencies associated with 'parallel policies':** Federal abrasions lead to either the Centre or the States duplicating the other's policies.
    - Eg: **Pension reforms:** Though States joined the National Pension System initially; some States have started to roll back to the old pension scheme.

Mutual Dependence in Concurrent Spheres:

- **Article 258A:** It empowers both the Centre and States to legislate on concurrent subjects like education, health, and forests. Implementing these laws across diverse regions requires **inter-governmental cooperation**.
- Conversely, the Centre relies on the vast administrative machinery of the States to reach the grassroots and ensure effective implementation of its directives.

Conclusion

- While navigating the challenges of increased disputes and differences, acknowledging and fostering interdependence between the Centre and States is crucial for a resilient and effective federal system that caters to the needs of a diverse and evolving nation like India.

14) Recognising the impact of climate change on health

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- As climate change continues unabated, this article examines how climate change affects the country's health.

How are climate change and health related?

- **Direct effect:** Climate change affects health directly, causing more sickness and death.
    - Climate change could **facilitate the growth of vectors** such as mosquitoes,

sandflies, ticks and change the seasonality of infection through changes in their life cycle. It could also facilitate the introduction of vectors and pathogens into areas where they did not exist before, such as mosquitoes in the Himalayan States.
    - Heat also **alters the virulence of pathogens.**
    - Heat, physical exertion, and dehydration, a constant state for laborers, could lead to kidney injuries.
    - The **risk of dying from pulmonary disease increases** by 1.8–8.2% during a heat wave and hospitalization rates will go up by 8% for every 1% increase in temperature above 29°C.
    - **Epidemics commonly occur after floods,** but extended warm periods also **promote the proliferation of water and food-borne pathogens and diseases.**
- **Indirect effect:** In indirect ways, it affects nutrition, reduces working hours, and increases climate-induced stress.
    - **Affects nutrition:** Reduced availability of food and water and the decrease in nutritional value of food increases vulnerability to diseases.
    - Depression, aggravated by stress generated by the change in weather conditions, and Post Traumatic Stress Disorder invariably accompany a climate emergency.
- India's inadequate health systems make our population particularly vulnerable to the impact of climate risks on health.

Way Forward

- **Recognise climate change as a problem:** India has to recognise climate change and its impact on health as a problem that can be and needs to be addressed.
- **Understand impacts of climate change on health:** Mitigation efforts begin with understanding the direct and indirect pathways by which climate change impacts health and assessing the burden. Pathways of climate change and their impact will determine the appropriate area of intervention.
- **Socio-Economic Support Systems:** Systems for social support and health services should be developed, considering the socio-economic factors that accentuate climate change impacts.
- Focus on **better urban planning, green cover, water conservation, and public health interventions.**
- **Action at all levels:** Action to control climate change needs to happen at global, regional, and local levels. National, State, and local governments have to decide to act on the policy options that have been generated by research on climate change.

15) A Norwegian perspective of India's digital journey

(GS3: Achievements of Indians in Science & Technology; Indigenization of Technology and Developing New Technology)

Context

- India's use of Digital Public Infrastructure (DPI) as a tool for achieving "Leaving no one behind" is impressive and offers valuable lessons for international development efforts worldwide.

- This article discusses the above from the perspective of the Norwegian Minister of International Development.

India's role in accelerating the digital public goods agenda

- **Global Recognition for DPGs:** India successfully placed Digital Public Goods and DPI firmly on the international development agenda, showcasing their potential for driving inclusive and sustainable progress.
- **G-20 Framework for DPI:** Securing agreement on a common framework for DPI across the G-20 member countries is a significant achievement, paving the way for coordinated global efforts and knowledge sharing.
- **Leadership in South-South Cooperation:** India's leadership in DPG development and implementation demonstrates the crucial role of the global South in shaping effective solutions.

The Norwegian perspective

What is DPGA?
• The Digital Public Goods Alliance (DPGA) is a multi-stakeholder initiative that aims to accelerate the attainment of the Sustainable Development Goals (SDGs) in low- and middle-income countries by facilitating the discovery, development, use, and investment in digital public goods.

Norway's significant contributions to digital public goods (DPGs):

- Norway is the co-founder and member of the DPGA, which provides a registry of certified digital public goods.
- Norway also recently pledged to become a frontrunner country in the 50-in-5 campaign, which was launched recently by the DPGA, the United Nations Development Programme and others. In this campaign, countries pledge to make at least one national digital goods available globally in the next five years.
- **Examples of Norway's DPGs:**
  - **Weather services of the Norwegian meteorological services Yr:** It is used to forecast weather around the world.
  - **District Health Information Software 2 (DHIS2), managed by the University of Oslo:** The system is the world's largest health management information system platform and is used by health authorities in 73 low- and middle-income countries, representing 30% of the world's population.

Way forward

- **Financing:** Developing and maintaining DPGs requires significant resources. Governments, businesses, and philanthropic organizations need to collaborate to ensure sustainable financing models for their development and upkeep.
- **Security:** Governments and businesses need to respond to increasingly challenging concerns of privacy and data leaks.
- **Digital Sovereignty and Openness:** Countries need to find ways to safeguard their digital sovereignty without compromising on an open, free, and secure internet for all. Open-source DPGs can be a way to achieve this balance.
- **Certification and Pooling:** Under the global lead of the DPGA, certifying and pooling DPGs is

crucial to accelerate adoption of DPGs globally.

16) A 5$ trillion economy but for whom?

(GS3: Inclusive Growth and issues arising from it)

Context

- According to the **IMF's World Economic Outlook**, the size of the Indian economy will increase from $3.2 trillion in 2021-22 to $3.5 trillion in 2022-23 and cross **$5 trillion in 2026-27.** In this backdrop, this article tries to analyze the challenges and issues in achieving the 5$ trillion economy.

Government's roadmap and measures

- The government's roadmap to making India a $5 trillion economy comprises measures like
  - Focussing on **inclusive growth**
  - Promoting **digital economy**
  - Technology-enabled development
  - **Energy transition** and climate action, and
  - Relying on a virtuous cycle of investment and growth
- Major reforms like **Goods and Services Tax (GST), Insolvency and Bankruptcy Code (IBC), a significant reduction in the corporate tax rate, the Make in India and Start-up India strategies, and Production Linked Incentive Schemes (PLIs)**, among others, will initiate growth of the Indian economy.

Challenges in achieving the 5$ trillion target

- India's economic growth pivots on capital, productivity and labor, and data show that for over four-fifth of Indians, the $5 trillion economy is a bridge too far.
  - **Capital challenge:** According to Oxfam, in 2021, **1% of the population owned about 41% of the nation's wealth, while 50% owned 3% of its wealth.** However, investment is funded by the low resource citizens.
    - Approximately 64% of the total Goods and Services Tax (GST) came from the bottom 50% of the population, and the top 10% contributed 3% of GST.
  - **Labour challenge:** The contribution of labor, the other driver of growth, is limited due to dubious educational and skill attainments and halting digital literacy.
  - **Productivity is just beginning to get a boost** through the creation of digital and physical infrastructure.
- **Low Per Capita income:** With a per capita income of **$2,400, India ranks 149 among 194 countries** in 2022. There are no official estimates of India's per capita income projected to be at $5 trillion. (Japan's Per Capita Income-$34,000, China's-$13,000)
- **Inequality challenge:** India has a value of 21.9 in the inequality index of World Economics which has a scale of 0-100, where a high value indicates a more egalitarian society. (Japan and China have a value of more than 50).

Conclusion

- India should strive to become 5$ trillion economy without deepening the existing divides.

17) Why India should invest in mining

(GS3: Indian Economy and issues relating to Planning, Mobilization of Resources, Growth, Development and Employment)

Context

- The US Department of Defence have found that the **Hindu Kush Mountain range in the Nurestan province in Afghanistan** could potentially possess a trillion dollars' worth of **critical and rare earth minerals.**
- Geological reports suggest that it is likely that such minerals could also be found in the **northern Indian side of the Hindu Kush range** since these were formed from tectonic shifts of the Gondwana supercontinent.
- This hypothesis has gained further acceptance with the **early discovery of lithium in Jammu and Kashmir** this year.
- In this backdrop, this article highlights the significance of investing in the mining sector in India.

Rationale for investing in mining

- **Underutilized resources:** India is **one of the least explored** (less than 10 per cent of India's landmass) and mined (2 percent mined) large countries in the world. As India is a resource rich country, investing in mining may result in self sufficiency in raw materials. With a **long coastline and the emergence of deep-sea mining technologies,** there could be further finds in our sea and ocean beds.
- **Electric mobility transition:** Demand for minerals such as lithium, cobalt, nickel and rare earths is expected to increase 20 to 40 times over the next few decades as oil-based combustion-engine technology is now being recast with electric mobility technology driven by batteries using these minerals.

Significance of investing in mining

- **Job opportunities:** Mining and exploration are much more **job-intensive than traditional manufacturing**.
  - The 12th Five Year Plan (2012-17) said that for every percentage point of growth in economic activity, **mining creates 13 times more jobs than agriculture and six times more than manufacturing.**
- **Inclusive employment:** Mining and exploration employ locals relatively lower-skilled people than semiconductor or automotive manufacturing which means greater employment opportunities for backward castes, dalits and tribals.
- **Can help India to cater to global demand:** As global critical minerals race underway with countries such as Indonesia, the Republic of Congo, Chile, Australia and now Afghanistan in substantial lead, efficiency and productivity in exploration and mining for rare earths and other minerals will be key to India's ability to catch up and cater to global demand.

Challenges in mining sector

- Indiscriminate mining and exploration can cause **legitimate environmental concerns.**
- **Land acquisition and labor conditions** are more pressing issues around mining in India.
- Mining and exploration are **capital and technology-intensive,** especially with developments in deep-sea mining. Private sector is capable of bringing in the latest foreign technologies, large amounts of capital and deploying it

efficiently. However their track record in mining has not been exemplary.

Way forward

- India needs a **robust set of environmental protection, labor and land laws** that should be enforced by competent regulators.
- An **active government policy with incentives and strict regulations** to spur large-scale **private sector exploration** for critical minerals and rare earths is needed.
- India should learn from the initiative, **'Reimagining the economy'** launched by the Kennedy School of Government at Harvard University that calls for a government-directed active industrial policy with a focus on jobs and the labor market rather than on output and growth.
- In the contest between livelihoods for millions and ecological conservatism, the need is for a **delicate balance tilted towards livelihoods.**

18) How to solve the problem of stubble burning

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- The article analyzes the issues associated with stubble burning and suggests solutions to overcome the problem.

What is stubble burning?

- Stubble burning is the **process of intentionally setting fire to the straw stubble** that remains after grains, like paddy, wheat, etc., have been harvested, to remove them from the field to sow the next crop.
- This is commonly practiced by farmers of **Punjab and Haryana.**

Evolution of stubble burning

- During the late 1970s and early 1980s, which was the **Green Revolution era,** Punjab and Haryana **shifted from their traditional crops** (maize, pearl millet, pulses and oilseeds) to the wheat-paddy cultivation cycle. **Free or subsidized power supply for groundwater** extraction plays a role here in the shift.
- In Punjab and Haryana, while the paddy crop is usually harvested between the first and last weeks of October, the wheat crop is sown from the first week of November.
- Paddy harvesting and threshing are labor-intensive and in case of **shortage of cheap labor machines like the Combined Harvester** are used which only pick the plant's top part (panicle) and leave the remaining stalk of about 2-3 feet (stubble) standing in the field.
- With only **10-15 days between** the rice-harvesting season and the wheat-sowing time, farmers often burn the stubble to quickly eliminate the paddy stubble.

Who does farmers resort to stubble burning?

- Lack of knowledge about **effective alternatives** to stubble burning.
- Lack of **affordable mechanisation** to cater the needs of millions of farmers.

Issues surrounding the stubble management

- Unlike wheat straw, which is commonly used as animal feed and sells at good prices, rice is **unfit to be fed to cattle** because of its **high content of unpalatable silica**, and, therefore, has **little market value.**
- If ploughed back into the field, it **interferes with subsequent crop operations.**
- Only **some farmers use farm machines** like happy seeder and

straw management machines to incorporate the stubble back into the soil instead of setting it on fire.

- Even after encouraging multiple initiatives including applying a decomposer to encourage in-situ management of stubble or using the **direct seeding of rice (DSR) technique** by the center and state, the problem remains intractable.

Direct seeding rice (DSR) is a practice of sowing paddy which involves planting rice seeds directly into the field, instead of the traditional method of growing seedlings in nurseries and then transplanting them into the fields.

Possible solutions

- **Rethink the policy of providing free power:** Give a **direct cash/benefit transfer (DBT)** instead of a power subsidy. This can avert the over-exploitation of groundwater and help diversify crops away from paddy.
- **Create a market for paddy straw/stubble:** An effective market has to be created for stubble that at least compensates them for the extra effort and cost involved in its harvest, collection and disposal.
- **Convert straw to CBG:** Among various options, the **use of straw for the production of compressed biogas** through methods of anaerobic digestion is best from economic and environmental perspectives. It also produces **bio-slurry,** which can go back into the soil to **replenish soil fertility.**
- **Subsidized machineries:** Further **modifications and subsidized supply of machinery** for in-situ use of paddy stubble will also be very helpful in preventing farm fires in some areas.
- **Legal enforcement:** Once an effective channel for procuring paddy straw is created, a **law against the burning of any crop straw** should be strictly enforced.

Conclusion

- With market avenues for crop residue, legal backing against polluting practices and administrative support, the proposed system can work to prevent stubble burning while saving the health of millions of lives and contributing to the economy.

19) The road to elimination of tuberculosis, the road to India's success

(GS2: Issues Relating to Development and Management of Social Sector/Services relating to Health, Education, Human Resources)

Context

- The article highlights the **positive progress India has made in reducing Tuberculosis (TB) incidence and mortality** since 2015, exceeding global decline rates.
- Despite this success, achieving the ambitious goal of TB elimination by 2025 seems unlikely due to several existing challenges.

What is TB?

- Tuberculosis (TB) is a disease **caused by bacteria called Mycobacterium tuberculosis.** TB is an ancient disease and has been documented to have existed in Egypt as early as 3000 BC.
- TB most commonly affects the **lungs** (pulmonary TB), but it can also affect **other organs** (extra-pulmonary TB).
- TB **spreads through the air** when a person with TB of the lungs or throat coughs, sneezes, or talks.
- Common symptoms of TB are:
    - Cough for three weeks or more, sometimes with

blood-streaked sputum; Fever, especially at night; Weight loss and Loss of appetite.

Treatment for TB

- **Directly Observed Treatment Short-course (DOTS)** is the strategy followed for treatment of TB. Tuberculosis treatment requires **at least 6 months of treatment.**
- Currently, **BCG (Bacillus Calmette-Guerin)** is the only licensed vaccine available for the prevention of TB.
- BCG **works well in certain places but not so well in others.** Generally, the farther a country is from the equator, the higher is the efficacy.
- However, BCG gives **excellent protection against severe forms of tuberculosis in children.**

Key challenges in eliminating TB

Global TB Report 2023
• It is released by the **World Health Organisation.** • It noted that since 2015, TB incidence and mortality have **declined by 16 per cent and 18 per cent** respectively, faster than the decline globally.

Detection gaps:

- Testing majority of patients (77%) through less accurate smear microscopy, which has an accuracy of 22-43 per cent and cannot detect resistance to anti-TB drugs.
- Inefficient current testing rate of 1.2 percent.
- Heavy reliance on symptomatic screening tends to miss out on asymptomatic patients.

Drug shortages

- Recent reports of drug shortages across states hinders treatment completion.

Treatment Adherence:

- Ensuring adherence to the treatment remains a challenge to prevent drug resistance and transmission.

Lack of Vaccine

- BCG vaccine used in infants is insufficient for complete protection and it necessitates development of a new vaccine for long-term elimination.

Government efforts

- **Ni-kshay portal**
  - NI-KSHAY-**(Ni=End, Kshay=TB)** is the **web enabled patient management system for TB control** under the **National Tuberculosis Elimination Programme (NTEP).**
  - It is developed and maintained by the Central TB Division (CTD), **Ministry of Health and Family Welfare, Government of India,** in collaboration with the National Informatics Centre (NIC), and the World Health Organization Country office for India.
  - Ni-kshay is used by health functionaries at various levels across the country both in the public and private sector, to **register cases** under their care, **order various types of tests** from Labs across the country, **record treatment details**, **monitor treatment adherence** and to transfer cases between care providers.
  - It also functions as the **National TB Surveillance**

System and enables reporting of various surveillance data to the Government of India.

- Transformative policies were introduced by the government including universal nutritional support for patients, effective engagement with the private sector, to the first-of-its-kind crowd sourcing programme to help patients complete treatment.
- Enhanced government funding also plays a role in effective elimination of TB.

Way forward

Strengthen testing:

- Prioritize widespread adoption of molecular diagnostics for accurate and efficient diagnosis. Increase testing rate to 4 to 5% from the current 1 to 2%.
- Consider alternative screening tools like portable AI-enabled X-rays which can be efficient and affordable.

Address drug shortages

- Reassess the decentralization policy and explore alternative models for affordable drug procurement.
- Consider less toxic treatment options and ensure its availability like the WHO-recommended **BPaL(M) (Bedaquiline, Pretomanid, and Linezolid) regimen** for drug-resistant patients.

Develop a vaccine

- Support and accelerate research efforts towards developing a new and effective TB vaccine.

20) UN report on groundwater extraction: Every drop counts

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- A recent report published by United Nations University has warned that **27 of the 31 aquifers** in the country are depleting faster than they can be replenished.
- In this backdrop, this article explains the causes for faster depleting aquifers and suggests measures to address the issue effectively.

Causes

- **Little understanding of river systems** or their interconnections with the health of catchment areas or groundwater - as per Shah Committee.
- Poor state of the country's aquifers.
- **Overuse of groundwater globally** — more than China and the US combined.
- Little emphasis on institutional innovations in the water sector.
- Addressing demand-side management remains a complex problem in states like Punjab where the link between power subsidies and the falling water table is apparent.
- **Impact of climate change on aquifers:** In the country's southwest, where aquifers of hard rock already impose limits on recharging. Hotter temperatures could leave less moisture to soak in the soil and replenish groundwater sources.

Government efforts

- **Atal Bhujal Yojana:** Atal Bhujal Yojana which commenced in 2020, aims to bring about behavioral changes at the community level in **seven states** (78 water stressed districts). Ministry data does show that groundwater extraction for irrigation, domestic and industrial uses came down by about 6 billion cubic meters in 2022 from 2020.

- **Promoting water efficient crops:** In recent years, the Centre has been trying to promote less thirsty crops like millets and the use of efficient watering techniques. The use of technologies that allow people to monitor the water available in their borewells could be the first step to nudge them to manage aquifers responsibly.

21) Don't ignore the threat of antimicrobial resistance

(GS2: Issues Relating to Development and Management of Social Sector/Services relating to Health, Education, Human Resources)

Context

- The article effectively highlights the urgency of addressing AMR and emphasizes the need for multi-pronged action at different levels.

Delhi Declaration

- The Delhi Declaration during India's G20 presidency saw a **commitment to strengthen the global health architecture**
  - By building more resilient, equitable, sustainable and inclusive health systems to implement the **One Health approach**
  - Enhancing **pandemic preparedness**
  - Strengthening existing **infectious diseases surveillance systems.**
  - Prioritize **tackling Antimicrobial Resistance (AMR)** through research and development (R&D), infection prevention and control, as well as antimicrobial stewardship efforts within respective National Action Plans (NAPs).
  - Adopting a pledge to **facilitate equitable access to safe, effective and affordable vaccines,** therapeutics, diagnostics and other medical countermeasures, especially in Low- and Middle-Income Countries, Least Developed Countries and Small Island Developing States.

Why is AMR given importance?

What is Antimicrobial Resistance?

- Antimicrobial resistance happens when **microorganisms (such as bacteria, fungi, viruses, and parasites)** change when they are exposed to antimicrobial drugs (such as antibiotics, antifungals, antivirals, antimalarials, and anthelmintics).
- Microorganisms that develop antimicrobial resistance are sometimes referred to as "**superbugs**".
- As a result, the **medicines become ineffective** and infections persist in the body, increasing the risk of spreading to others.

- AMR is responsible for a **shockingly high number of deaths** which is equal to that of diseases like HIV and malaria.
  - A 2021 report by Lancet, documenting data from 204 countries, estimated that 4.95 million deaths were associated with bacterial AMR, and 1.27 million deaths were directly attributed to bacterial AMR.
- **Sub-Saharan Africa and South Asia had the highest death rates**, signifying high susceptibility to AMR.
- The rising levels of antimicrobial resistance, driven by excessive antimicrobial use threaten to **compromise not only public-health gains** in the field of

infectious diseases but also jeopardizes cancer treatment, transplants etc.
- G20 countries are home to over 60 percent of the world's population and Africa's inclusion has the potential to significantly impact the global fight against AMR. It will have profound implications for low and middle-income countries with low investments in healthcare infrastructure.

Way forward

- For the intent of the declaration to translate into implementable action, it will require concerted global and local effort.

Priorities at the global level

- Work with developing countries to create regional AMR action plans.
- G20 countries should consider championing an international funding mechanism that **focuses on AMR R&D.**
- Efforts should be made to **promote patent reforms** for fostering innovation and ensuring affordability in new antibiotics.
- Dialogue among developing countries to explore models like the Medicines Patent Pool can be considered.

Priorities at the local level

- Effective implementation of national action plans like India's NAP-AMR.
- Expanding surveillance and monitoring networks beyond tertiary care hospitals.
- Strengthening initiatives like Free Diagnostic Services, Kayakalp, and adherence to Indian Public Health Standards.
- Promoting responsible antibiotic use through public education and engaging academia and Civil Society Organizations.

Global Precedents

- Indonesia has developed national surveillance plans.
- Australia prioritized animal health and committed to reducing antibiotic use in livestock.
- Brazil has shown reduction in antibiotic use in humans.
- The UK and the US are investing in research to develop new diagnostics, drugs and vaccines.

Conclusion

- By expanding the scope of existing surveillance and monitoring networks, promoting responsible behavior among citizens and encouraging collaboration among nations, India can lead the way in reducing the burden of AMR.

22) Beating air pollution is an investment, not an expenditure

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- This article gives a stark picture of the air pollution crisis in India and its devastating consequences.

Impact of air pollution

- **High death tolls:** According to the State of Global Air 2020 report, air pollution killed over 1.16 lakh newborns in India within 27 days of their birth. As per a study by Lancet Planetary Health, one of every five deaths in 2019 could be attributed to air pollution.
- **Health impact:** Cardiovascular diseases, stillbirth, preterm delivery, and low birth weight in babies are a result of exposure of pregnant women to bad air quality. An average Indian loses 5.3 years of his life expectancy due to air pollution and it is 12 years for the residents of Delhi.
- **Economic impact:** Premature deaths and increased morbidity as a direct result of air pollution leads

to a loss of output equal to US $37 billion, over 1 per cent of India's gross domestic product (GDP).

Causes of worst air quality in Delhi

- The drop in Delhi's air quality is caused due to cold, **heavy air-trapping pollutants** like vehicle emissions, construction dust, noxious gasses from industries, and smoke from stubble burning in the neighboring states of Punjab and Haryana.
- The other causes are **coal burning for energy generation, biomass and waste burning (both residential and commercial), brick kilns, and diesel generators.**

Is the air pollution limited to Delhi?

- Over the years, Delhi's **Air Quality Index (AQI),** has consistently been **over the World Health Organisation's acceptable limit by 8-10 times.**
- Though Delhi makes the headlines every year, the problem is not limited to the National Capital Region (NCR) and it is a **pan-India problem.**
- Cities in Uttar Pradesh, Haryana, Rajasthan and Bihar have regularly featured in lists of Indian cities most affected by air pollution.
- A report released by **The Energy Policy Institute at Chicago (EPIC)** shows that **out of the 50 most polluted cities in the world, 39 are in India.**

Current measures

- **Short-term solutions** like odd-even car restrictions and temporary smog towers are deemed **insufficient**.

Recommended measures

- Long-term national policy interventions are needed both at the macro level and the micro level.
    - **Transport sector:**
        - Phasing out petrol or diesel vehicles and **switching to electric vehicles (EV).**
        - Heavily subsidise electric vehicles to persuade consumers to switch to EVs.
        - **Encourage use of public transport and cycling**, for short distances.
        - The **use of bioethanol** instead of conventional fossil fuels will also lessen the burden on the environment.
        - A **congestion tax** can be levied on private car owners driving during peak hours.
    - **Industrial sector:**
        - Brick kilns need to adopt the **Induced-Draught Zigzag Kilns** instead of the widely-used Fixed Chimney Bull's Trench Kilns. Stacking the kilns in a **zigzag pattern** leads to more efficient fuel combustion, and reduces PM2.5 emissions by 20 percent and black carbon emissions by 30 per cent.
        - Highly polluting industries should be monitored for particulate matter concentration and emission rate through **Online Continuous Emission**

Monitoring Systems (OCEMS).
- **Heavy fines** must be levied for exceeding applicable limits.

- **Residential sector:**
  - Open burning of garbage and household waste needs to be completely banned and strictly enforced.
  - Switch from traditional cooking fuels such as firewood, coal, cow-dung cakes in rural and deprived households to 100 percent usage of LPG fuel.
- **Environmental sector:**

Environmental Performance Index
• The Environmental Performance Index (EPI) is a **biennial index,** launched by the **World Economic Forum** in partnership with the Yale Center for Environmental Law and Policy and the Columbia University Center for International Earth Science Information Network. • India has been **ranked at the bottom in a list of 180 countries** that were judged for their environmental performances in the 2022 Environmental Performance Index.

  - Prioritize environmental protection over industrialisation.

Conclusion

- Mitigating air pollution in India must be viewed as an investment, rather than expenditure. This will ensure future social and economic growth.

23) Need for climate-smart agriculture in India

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- Climate change and food insecurity are the two most important issues facing humanity in the 21st century. This article analyzes the **interconnectedness between climate change and food insecurity** and also emphasizes the significance of climate smart agriculture.

Effects of climate change

- Some of the ongoing effects of climate change, such as heat waves, flash floods, droughts, and cyclones, are negatively influencing lives and livelihoods.
- Severe drought experienced due to climate change in the southern continents negatively impacts agricultural production and farmers' livelihoods.
- As a result of climate change, traditional farming practices are becoming less productive.
  - In India, **crop yield decline owing to climate change (between 2010 and 2039) could be as high as 9%.**

Climate Smart Agriculture- A Viable Solution

What is Climate Smart Agriculture?

- According to the **Food and Agriculture Organization,** "Climate-smart agriculture is an approach for **transforming food and agriculture systems to support sustainable development and safeguard food security** under climate change".
  - Example: Precision Farming.

Objectives

- CSA comprises three pillars or objectives:

- Sustainably increase agricultural productivity and incomes
- Adapt and build resilience to climate change
- Reduce/remove GHG (greenhouse gasses) emissions.

Dimensions

- Dimensions of climate-smart practices include **water-smart, weather-smart, energy-smart, and carbon-smart practices.**

Benefits/significance of Climate Smart Agriculture

- They improve **productivity**, deal with land degradation, and improve soil health.
- CSA promotes **crop diversification, increases water efficiency,** and integrates drought-resistant crop types, all of which help lessen the disruptive effects of climate change.
- CSA **increases resilience** in the face of longer-term stressors like shorter seasons and erratic weather patterns by reducing exposure to climate-related dangers and shocks.
- CSA has the ability to **increase agricultural output** while maintaining ecological stability which is essential for long-term food security and sustainable resource usage in a warming planet.
- CSA increases the **economic autonomy** of farmers. It causes a dramatic change in farming communities' economic and social structure by distributing information about and providing access to climate-resilient methods.
- CSA is a promising indicator for the future of **biodiversity conservation.**
- CSA's ecosystem-based approach and different crop varieties help cropland and wild regions coexist together. This collaborative effort helps to safeguard native plant species, keep pollinator populations stable, and mitigate the effects of habitat degradation.
- CSA contributes to **climate change mitigation by reducing greenhouse gas emissions** and **enhancing carbon storage.**
- CSA substantially contributes to climate adaptation, mitigation, and food security.

CSA implementation in India

- The **National Action Plan on Climate Change** emphasizes the role of climate-resilient agriculture in India's adaptation measures.
- Programmes such as the **Soil Health Card Scheme** use precision nutrient management to optimize agricultural methods.
- The National Adaptation Fund for Climate Change, National Innovation on Climate Resilient Agriculture, Soil Health Mission, Pradhan Mantri Krishi Sinchayee Yojana, Paramparagat Krishi Vikas Yojana, Biotech-KISAN, and Climate Smart Village are a few examples of government initiatives in India focusing on CSA.

Way forward

- **Agroforestry and carbon sequestration** are two examples of CSA measures that could help India meet its international obligations and contribute to the global fight against climate change.
- Investing in **capacity-building programmes** and providing practical CSA tools and knowledge is essential.

Conclusion

- CSA has the potential to assure food security, empower farmers, and protect our delicate ecosystems by

merging innovation, resilience, and sustainability. The intersection of climate vulnerability and agricultural importance places India at a unique juncture where CSA adoption is not merely desirable but essential.

24) Stocktaking climate finance

(GS3: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Context

- This article highlights the **critical role of climate finance in promoting trust** and progress of the developing countries in future climate change negotiations.

Challenges in climate finance

Under **Article 9 of the Paris Agreement on Climate Change**, it is also mandatory for the developed countries to provide in their Biennial Update Reports (BUR), information relating to the financial resources which they have provided and, also, the projected levels of public financial resources to be provided to developing country parties.

- **Inadequate $100 billion goal:** The commitment of developed countries at the Copenhagen Change Conference in 2009 to mobilize the sum of $100 billion is inadequate in terms of the challenges faced by the developing countries in switching over to a low carbon development path and climate resilient development.
- **Unfulfilled promises:** Developed countries committed to $100 billion per year by 2020, but fell short with mobilizing only $79.6 billion in 2021.
- **Estimating adequate climate finance:** India's financial needs derived from its NDCs for adaptation and mitigation purposes for 2015-30 are $206 billion and $834 billion, respectively.

- India at the **COP26 to the UNFCCC** held in Glasgow in 2021 expressed to intensify its climate action by updating its NDCs and presented to the world five nectar elements (Panchamrit) of India's climate action.
- The updated NDCs is as follows:
  - India will increase its **non-fossil fuel power capacity to 500 gigawatts (GW)** by the end of the decade, up from 450GW.
  - **Half of India's energy needs** will be fulfilled by **renewable sources by 2030.**
  - **India's 2030 carbon intensity goal** measured as carbon dioxide emissions per unit of gross domestic product will be increased from **35% to 45%.**
  - The country will also strive to **cut carbon-dioxide emissions by 1 billion tonnes** from business as usual by 2030.
  - By 2070, India will achieve the target of **net-zero emissions.**

- **Unclear burden sharing formula:** The developed countries are mandatorily required to provide financial resources to developing country parties, but there is no agreed approach among developed countries to share the burden of this goal. For instance, the United States provided just 5% of its fair share in 2020.
- **No designated financial mechanisms:** Most of the financial needs are required in transitioning towards low-carbon, cleaner energy systems from traditional

systems, which will not be funded by the designated financial mechanisms of the United Nations Framework Convention on Climate Change (UNFCCC).
- **Replenishment challenges:** Mechanisms like the Green Climate Fund depend on voluntary contributions, with low participation from developed countries.
- **Lack of political will:** Strong political will, perceived urgency are lacking to facilitate necessary climate finance transfers from developed to developing countries

Conclusion

- COP 28 serves as a pivotal moment to address existing shortfalls and establish a sustainable approach to supporting developing countries in climate action.

25) The world is getting older. Can India cope?

(GS2: Welfare Schemes for Vulnerable Sections of the population by the Centre and States and the Performance of these Schemes)

Context

- The article effectively highlights the complex interplay between population trends, economic growth, and geopolitical power dynamics.

India's population

- India surpassed China as the most populous country in 2023.
- India's fertility rate is below replacement level, leading to a **projected population decline** after 2050.
- According to UNFPA's India Aging Report, 2023, the **elderly population (60+) will double by 2050, reaching 20% of the total population from the current 10.5%.**

Highlights of India Aging Report

- The report points out that **developing countries are presently witnessing a significant drop in fertility levels** far sooner in their development journey than developed countries did.
- The report has estimated that **India's elderly population (people over 60 years) will grow at a rapid 41 per cent** between 2021 and 2031.
- It further notes that the **number of elderly people will be larger than the number of children (those below 15 years) by 2046.**

Consequences of aging populations

- **Below replacement level fertility rates combined with increased longevity** will ensure that the elderly constitute a significant segment of our population.
- The unprecedented rise in the aging population will have **significant implications for health, economy and society in India.**
    - **Economy:** Aging populations mean fewer workers, fewer taxpayers and hence, a reduction in a country's ability to generate wealth. India's economic growth could be hampered by the demographic shift.
    - **Health:** Aging population enhanced burdens on healthcare systems.

Conclusion

- Given the challenges associated with an aging population, India should take efforts to prepare for its changing demographics.

26) The small grid – energy security

(GS3: Infrastructure: Energy, Ports, Roads, Airports, Railways etc)

Context

- This article highlights the potential of solar mini-grids as a cost-effective and sustainable solution for providing energy access and driving rural development in underserved regions.

Solar mini grids- a revolution

- A private sector-led revolution is underway in the means of **clean energy mini-grids** that are popping up in rural communities across Asia, Africa, Latin America and Small Island Developing States to lift 500 million people out of energy poverty.
- According to the **World Bank** - which recently set a target to fund a **thousand mini-grids in Nigeria,** where over 90 million people still live without electricity - private sector owned and operated solar mini-grids are the **most cost effective and sustainable way to bring electricity** for the first time to 75 percent of the 675 million people worldwide who still live in darkness, most of them in Sub-Saharan Africa.

Significance of Solar mini-grids

- Solar mini grids are **sustainable and cost effective alternatives** to traditional power sources like diesel generators and offer immediate environmental benefits.
- Decentralized energy systems like solar mini-grids are crucial to **address climate shocks like drought, heat stress and flooding.**
- The **adaptation and resilience capability** of mini-grids is critical for farming-dependent rural Africa and Asia, which are the world's most climate-vulnerable regions.
- Mini-grids can also **integrate with existing grids** to serve more consumers. Eg: Cambodia.
- Mini-grid companies besides delivering reliable and clean power, also offer a range of other **services that drive rural prosperity** like mobile telephony, irrigation, agro-processing, e-mobility etc.

India's case

- In India, about 700 solar mini-grids are owned and operated by a handful of private companies that are commercially viable.
- These grids are largely in the states of UP, Bihar and Jharkhand, which have seen significant progress on a number of sustainable development goals based on the success of these mini-grids.

Scope of solar energy

- Solar energy presents a financially viable path to energy independence, bolstering security and reducing reliance on fossil fuels.
- The cost of solar PV energy is now highly competitive, standing at $24/MWh, lower than both coal and natural gas. This underscores the holistic benefits of investing in solar energy.

Challenges ahead

- **Investment gap:** The current level of global solar investments represents only 10 per cent of the required amount to achieve net-zero emissions.
    - For instance, developing countries, which are home to over 50 per cent of the global population, received a mere 15 percent of renewable energy investments in 2022 with Sub-Saharan Africa facing a significant drop.

- **Bias towards large-scale solar projects:** Smaller-scale solutions like mini-grids need more support.

Way forward

- The **International Solar Alliance (ISA)** is actively spearheading an initiative through its **Global Solar Facility (GSF).**
- Geared towards catalyzing investments in solar projects, the **GSF places special emphasis on underserved regions in Africa.**
- With a fund of $100 million, it aims to enable $10 billion in investments, providing clean energy access for 35–40 million African households by 2030.
- This fund, fortified by **payment guarantees, insurance, and investment vehicles,** will mitigate risks and bolster investor confidence in decentralized solar applications in Africa, thus rectifying the skewed investment pattern in solar.
- Implement **guarantees and introduce innovative financial mechanisms** complemented by robust risk underwriting that can catalyze private sector investment.
- **Collaboration between private and public sectors** can drive innovation, enabling developing economies to achieve a trajectory of robust energy supply with minimal carbon emissions. Eg: India's successful initiative to offer electricity through both large centralized grids and decentralized renewable energy sources is serving as an exemplar for clean energy adoption.

In-Focus

1) Malware Malice

(GS3: Awareness in the fields of IT, Space, Computers, Robotics, Nano-technology, Bio-technology and issues relating to Intellectual Property Rights)

Context

- Recently, over a dozen Opposition leaders and journalists received email alerts from Apple that their devices were targeted by "state-sponsored attackers" that suggest it could be a repeat of the pegasus attack.

History of Pegasus

- Pegasus is a **spyware** developed by NSO Group, **an Israeli surveillance firm**, that helps spies hack into phones. It can be used to **remotely access and monitor mobile phones,** including calls, messages, and location data.
- In 2021, a consortium of media organizations revealed that Pegasus had been used to target the phones of journalists, activists, politicians, and other high-profile individuals in India. The Indian government has denied any involvement in the hacking.
- The Pegasus attack has raised **serious concerns about privacy and freedom of expression** in India. It has also led to calls for greater transparency and accountability from the government.

What is spyware?

- Spyware is loosely defined as **malicious software designed to enter a device, gather sensitive data**, and forward it to a third party without the user's consent.
- While spyware may be used for commercial purposes like advertising, malicious spyware is used to **profit from data stolen** from a victim's device.
- Spyware is broadly categorized as **trojan spyware, adware, tracking cookie, and system monitors.**
- While each type of spyware gathers data for the author, system monitors and adware are more harmful as they may make modifications to a device's software and expose the device to further threats.

What is commercial spyware?

- Malicious spyware initially was limited to being used by criminals to steal passwords or financial information. However, opportunities for **governments and law enforcement agencies to use spyware as part of legal investigations** led to the development of commercial spyware.
- Commercial spyware mainly targets mobile platforms and can legitimately be used against **criminals and terrorists.** However, the **lack of global regulations** for companies developing spyware has led to their use by authoritarian governments **to spy on political opponents.**
- Commercial spyware, such as the **Pegasus spyware from the NSO group**, can reportedly not only mop up information from mobile devices but also turn on the camera and microphone without the owner's knowledge, effectively turning handsets into a spying device.

How are the devices targeted?

- In most of the cases, **malicious links were sent to the victim's device** however reports indicate that the spyware is capable of **zero-click attacks.** This means that they can infect a device without requiring users to click on a malicious attachment or link.

Is the use of spyware increasing?

- Between **2011 and 2023**, at least **74 governments contracted with commercial firms** to obtain spyware or digital forensics technology, according to the Carnegie Endowment for International Peace, an independent international affairs think tank.

What do Indian laws outline?

The Indian Telegraph Act, 1885

- **Section 5(2) of The Indian Telegraph Act, 1885,** states that the **Government can intercept** a "message or class of messages" when it is "in the interests of the sovereignty and integrity of India, the security of the State, friendly relations with foreign states or public order or for preventing incitement to the commission of an offense".
- The operational process and procedures for it appear in **Rule 419A of the Indian Telegraph Rules, 1951.**
- Under Rule 419A, surveillance needs the sanction of the Home Secretary at the Central or State level, but in "unavoidable circumstance" can be cleared by a Joint Secretary or officers above, if they have the Home Secretary's authorisation.

Information Technology Act, 2000

- Section 69 of the Information Technology Act, 2000 deals with electronic surveillance.
- It **facilitates Government "interception** or monitoring or decryption of any information through any computer resource" if it is in the interest of the "sovereignty or integrity of India, defense of India, security of the State, friendly relations with foreign States or public order" or for preventing or investigating any cognizable offense.
- The procedure for electronic surveillance as authorized by Section 69 is detailed in the **Information Technology (Procedure and Safeguards for Interception, Monitoring and Decryption of Information) Rules, 2009.**

Supreme Court rulings

- Rule 419A was added to the Telegraph Rules in 2007 after the verdict in the **People's Union for Civil Liberties (PUCL) vs Union of India case in 1996,** in which the Supreme Court said **telephonic conversations are covered by the right to privacy**, which can be breached only if there are established procedures.
- In the **K.S. Puttaswamy vs Union of India verdict of 2017**, the Supreme Court further reiterated the need for oversight of surveillance, stating that it should be **legally valid and serve a legitimate aim of the Government.**

BASICS OF CYBER SECURITY

What is cyber security?

- Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from unauthorized access, theft,change or destruction.
- **India has ranked tenth (10th) in Global Cybersecurity Index (GCI)** 2020 by

ITU (International Telecommunication Union) by moving up 37 places.

- According to EY's latest **Global Information Security Survey (GISS) 2018-19** – India edition, one of the highest number of cyber threats have been detected in India, and the **country ranks second in terms of targeted attacks.**
- According to the National Crime Records Bureau (NCRB), from 12,317 cases of cybercrime in 2016, there were 50,035 cases registered in 2020.
- **Banking and Telecom** are the most attacked sectors but Manufacturing, Healthcare, and Retail have also faced a significant number of cyber attacks.

Threats

- Based on the perpetrators and motives, cyberthreats can be disaggregated into four baskets - **Cyber Espionage, Cyber Crime, Cyber Terrorism, Cyber Warfare.**
- **Cyber espionage:** Act of cyber spying to illegally obtain confidential information of a government or an organization. It includes data theft, intelligence gathering etc.,
- **Cyber crime/attacks:** Act of targeting computer information systems, infrastructures, computer networks in order to destroy the communication network.
- **Cyber terrorism:** It is the convergence of terrorism and cyber space. Terrorists use cyberspace as a new arena for attacks in pursuit of their political and social objectives by planning terrorist attacks, recruitment of sympathizers, spreading propaganda to radicalize people, to raise funding etc.
- **Cyber warfare:** The act of using computer technology to deliberately attack information systems of a state or organization for strategic or military purposes.

Tools of cyber crimes

- **Malware**
  - Malware, or malicious software, is any program or file that is harmful to a computer user thereby stealing, encrypting or deleting sensitive data, altering or hijacking core computing functions. Malware includes computer viruses, worms, Trojan horses and spyware.
- **Ransomware**
  - A type of cybercrime whereby a system or network is infected by a malware which prevents legitimate users from accessing the computer or network. Then a ransom is sought by the creator of the malware to lift the restriction.
- **Phishing**
  - A method adopted to acquire private information by sending a official looking fraudulent email.
- **Denial of service**
  - A malware attack that prevents or impairs the authorized use of information system resources including access to email, online account, online banking services, news websites etc.,
- **Social engineering attacks**
  - Gaining confidence of individuals by manipulation and making them divulge confidential information to strangers.
- **Skimming**
  - A method by which a device is used to steal credit card information.

2) The role of the Governor in legislature

(GS2: Functions and Responsibilities of the Union and the States, Issues and Challenges Pertaining to the Federal Structure, Devolution of Powers and Finances up to Local Levels and Challenges Therein)

Context

- The Supreme Court recently observed that a Governor cannot refer a Bill for Presidential assent that is passed by the Assembly and later re-adopted or re-enacted.

Issue in detail

- The government of Tamil Nadu recently approached the Supreme Court challenging Governor R.N. Ravi's decision to keep various Bills and other proposals submitted by the state government pending indefinitely.
- The Supreme Court had issued notice to the Governor on a writ petition filed by the State government, accusing Mr. Ravi of delaying consent to the Bills. Later the Governor communicated to the Assembly that he had withheld consent to them.
- The Assembly, in a special session, re-enacted the Bills without amendments and sent them again to the Governor for his assent. The Governor referred the Bills to the President.
- The Tamil Nadu government in the Supreme Court recently criticized Governor R.N. Ravi for exhibiting "constitutional obstinacy" by referring 10 key Bills re-enacted by the State Assembly to the President for consideration.
- A three-judge Bench headed by Chief Justice of India D.Y. Chandrachud said the Governor, **having withheld his assent to the Bills in the first instance, cannot now refer the Bills, re-passed by the Tamil Nadu legislature, to the President.**

Reasons for potential conflicts

- **Disagreements on content:** The governor and the government may have differing views on the content of a bill, leading to conflict if the governor chooses to withhold assent.
- **Political affiliations:** In some cases, political differences between the governor and the ruling party in the legislature can contribute to disagreements over bills.
- **Misuse of power:** While rare, instances of governors using their power to block bills for personal or political gain have occurred.

Checks and balances:

- **Judicial review:** Courts can be approached to challenge the governor's decision to withhold assent if deemed arbitrary or unconstitutional.
- **Re-passage of bills:** Legislatures can choose to re-pass a bill with or without amendments after the governor returns it. If re-passed by a special majority, the governor generally has no choice but to grant assent.

What does the Constitution say?

- **Article 200** of the Constitution states that after the passage of a Bill by a state Legislative Assembly, or in case of a bicameral legislature, both Houses of the state, the Bill ought to be presented to the Governor.
- The Governor shall then have either of four options:
    - may give assent to the Bill
    - may withhold assent to the Bill, that is, reject the Bill in which case the Bill fails to become law
    - may return the Bill (if it is not a Money Bill) for

reconsideration of the State Legislature
    - may reserve the Bill for the consideration of the President.
- Article 200 also mentions that the Governor, after presentation of the Bill, must return it "as soon as possible" along with a message requesting the House to reconsider specific provisions within, or the entirety of the Bill.
- If the Bill were to be passed again and resent to the Governor, the Governor is obligated to not withhold it.

Does the Governor have discretion in this matter?

Withholding the assent

- As held by the Supreme Court in various cases including the **Shamsher Singh case (1974)**, the **Governor does not exercise their discretionary powers** while withholding assent or returning a Bill to the State Legislature. They are required to act as per the advice of the Council of Ministers.

Returning the bill for reconsideration

- The return of any Bill to the State Legislature for reconsideration is also to be done based on ministerial advice. However, Governors in the past have exercised their discretion in returning Bills, like the **Tamil Nadu Governor with respect to the Bill prohibiting online gambling.** However, the Governor **shall assent to such a Bill if it is passed again by the State Legislature.**

Reserving bill for President consideration

- The Governor must **reserve certain Bills**, like those which reduce the powers of the High Court, for the consideration of the President.
- They may also reserve Bills on concurrent lists that are repugnant to a Union law based on ministerial advice.
- It is only under rare circumstances that the Governor may exercise their discretion, where they feel that the provisions of the Bill will contravene the provisions of the Constitution and therefore, should be reserved for the consideration of the President.
- It must however be noted that the **Constitution does not lay down any time limit within which the Governor is required to make a decision.**

When does a Governor usually withhold the assent/return the bill?

- The situation of 'withholding assent' may arise in case of a **Private Members' Bill** (any Member of State Legislature other than a Minister) passed by the State Legislature, which the council of ministers do not want to be enacted into a law.
- In such an instance, they would advise the Governor to 'withhold assent'. However, this is an unlikely scenario as the council of ministers who enjoy a majority in the Legislative Assembly would not allow the passage of such a Bill.
- Secondly, if the **incumbent government whose Bill has been passed by the legislature falls** or resigns before it is assented to by the Governor, the new council may advise the Governor to 'withhold assent'.

What were the recommendations?

- **Sarkaria Commission** (1987):
    - Only the reservation of Bills for consideration of the President, that too under rare cases of unconstitutionality can be

  - implied as a discretionary power of the Governor.
  - It further recommended that the President should **dispose of such Bills within a maximum period of six months.**
  - In the event of the President 'withholding assent', the reasons should be communicated to the State Government wherever possible.
- **Punchhi Commission (2010)**
  - It had recommended that the Governor should take a decision with respect to a Bill presented for their assent within a period of six months.
- However, these recommendations have not been implemented till date.

How can this impasse be resolved?

- The Constitution may be amended to provide that the **Chief Ministers shall be consulted before appointment of the Governors.**
- The recommendation of the Punchhi Commission that **Governors may be removed through an impeachment by the State Legislature** can also be considered.

Conclusion

- Overall, the government and governor play crucial roles in the lawmaking process. While potential conflicts may arise, checks and balances are in place to ensure a fair and effective process. The ultimate goal is to pass laws that serve the best interests of the people while respecting the democratic principles of checks and balances.

Key Takeaways From Other Editorials

S.No	Topics	Content
1.	**Ethnic communities of Manipur** 	• **Kuki Zo:** The term "Kuki-Zo" is an umbrella term that encompasses several related ethnic groups within the larger Kuki-Chin-Mizo linguistic family. These groups have historically inhabited the hilly regions of Manipur and other parts of Northeast India. It consists of various tribes like the **Kuki, Thadou, Paite and Hmar.** • **Meitei**: The Meitei community is the majority ethnic group in Manipur and primarily inhabits the valley region. They have a rich cultural heritage, with their own language (Meiteilon) and traditional dance forms like the **Ras Lila.**
2.	**Hathi Committee Report** 	• The **Report of the Hathi Committee** (1975) is an important landmark in the **development of the Indian Pharmaceutical Industry.** • The Hathi Committee emphasized the **achievement of self-sufficiency in medicines** and of abundant availability at reasonable prices of essential medicines.
3.	**Core inflation** 	• Core inflation is a **measure of inflation obtained by excluding commodities of high price volatility** such as food items, energy products etc. • If temporary price shocks are taken into account, they may affect the estimated overall inflation numbers in such a way that they are different from actual inflation. To eliminate this possibility, core inflation is calculated to gauge the actual inflation apart from temporary shocks and volatility.
4.	**China plus one strategy** 	• The **China Plus One Strategy,** also known as **Plus One or C+1, coined in 2013** is a global business strategy/supply chain strategy that encourages companies to minimize their supply chain dependency on China by diversifying the countries they source parts from.
5.	**World Cities Day**	• World Cities Day is an **annual United Nations observance** held on **October 31st** to promote **international attention to the challenges and opportunities of urbanization.** • The day aims to encourage collaboration among

		nations, cities, and stakeholders to achieve sustainable and inclusive urban development. • **2023 theme: "Financing sustainable urban future for all"** focuses on unlocking transformative investment in urban planning and achieving adequate fiscal decentralization.
6.	**CPTPP** 	• The **Comprehensive and Progressive Agreement for Trans-Pacific Partnership** (CPTPP) is a Free trade agreement (FTA) between Australia, Brunei Darussalam, Canada, Chile, Japan, Malaysia, Mexico, Peru, New Zealand, Singapore and Vietnam. • Recently, the **U.K. Signed the CPTPP.**
7.	**Silkyara Bend Tunnel** 	• The **Silkyara Bend Tunnel** is a part of the Char Dham Pariyojana (project) in Uttarakhand. • It aims to improve connectivity to the religious pilgrimage sites of Gangotri, Yamunotri, Kedarnath, and Badrinath.
8.	**Poshan tracker** 	• The **'Poshan Tracker'** is a mobile based application rolled out by the **Ministry of Women and Child Development**, Government of India in 2021 through National e-Governance Division (NeGD). • It is a **centralized ICT-enabled platform**, developed to promote transparency and accountability of nutrition service delivery to the last mile. • Technology under Poshan Tracker is being leveraged for dynamic **identification of stunting, wasting, under-weight** prevalence among children and last mile tracking of nutrition service delivery.
9.	**Net neutrality** 	• Network neutrality **ensures that all data on the internet is treated equally by internet service providers** (ISPs) and governments, regardless of content, user, platform, application, or device. • For users, net neutrality enables access and transparency of internet content and allows access to all internet services and applications.
10.	**Gender related killings of women and girls published by UNODC and UN Women.**	• A study titled "Gender related killings of women and girls (femicide/feminicide)" published by the **United Nations Office on Drugs and Crime (UNODC) and UN Women.**

		**Report highlights** • According to the report, about 88,900 women and girls were intentionally killed worldwide on the grounds of gender related factors in 2022. • This is the highest number of such fatalities in a year, in the past 20 years. • Men formed 80% of the total victims of homicide in 2022, while women's share was 20%. • **Dowry** has consistently been the leading cause, while **honor killings and murder related to witchcraft accusations,** formed a small share too in the period between 2016- 2021.
11.	**BHASHINI** 	**BHASHINI - [BHASHa INterface for India] - the National Language Translation Mission (NLTM)** • It is a local language translation mission launched by the **Ministry of Electronics and IT** that aims to break the barrier between various Indian tongues by using available technology. • Bhashini aims to build a **National Public Digital Platform for languages** to develop services and products for citizens by leveraging the power of artificial intelligence and other emerging technologies. • Bhashini operates as an AI-driven language translation system, **breaking down language barriers** and enabling conversations between speakers of different Indian languages. • The platform is accessible through dedicated Android and iOS apps, providing a user-friendly experience.
12.	**Madhubani painting** 	• Madhubani painting is a **Geographical Indication (GI)- tagged art form** that originated in the **Mithila region of Bihar.** • It is one of the oldest and most vibrant art forms in India, with a history that can be traced back over 2,500 years. • It is renowned worldwide for its intricate detailing and vibrant colors. • Artists use **only natural pigments and brushes made from twigs** to create these visually captivating and culturally significant artworks. • It takes an incredible amount of patience and dedication to create a single piece of medium-sized artwork, and this talented artist dedicates 7-10 days to each masterpiece.

Model Questions

1. Discuss the significance of rural entrepreneurship in fostering economic growth and sustainable development in India.

2. Examine the key challenges hindering the widespread adoption of renewable energy sources in India. Suggest measures to overcome these challenges for achieving a sustainable energy future in the country.

3. "India's G-20 Presidency has been a 'People's Presidency' with landmark achievements in both the climate and development agendas". Discuss.

4. In recent years, pink bollworm infestations have posed a significant threat to cotton cultivation in various regions across the country. Discuss.

5. "Less than 2 percent of climate finance is used to develop methane-mitigation solutions." In reference to this statement, analyse how methane emission cuts can help in achievement of national climate targets.

6. Examine the capabilities and obstacles encountered by early warning systems amid the era of recurring climate change.

7. The health of the Amazon has significant implications for the overall health of the planet. Illustrate with suitable examples.

8. A shift from exotic cattle to indigenous breeds will help India's dairy sector stay profitable and sustainable. Critically analyse.

9. What are the potential risks and environmental concerns associated with untreated wastewater? Discuss.

10. Elaborate on some of the most notable advancements in biosphere reserve conservation at the local level. Also explain the significance of conserving them.

11. Beyond addressing proportionality, discuss the broader potential benefits and drawbacks of implementing delimitation.

12. Despite increased awareness and regulations, air pollution remains a persistent and complex problem. Discuss the key characteristics of air pollution that make it difficult to effectively address and suggest some measures to address it.

13. Discuss the potential consequences of ongoing friction between the center and states in India.

14. Extreme weather events exacerbated by climate change, directly impact human health and well-being. Analyze.

15. India can leverage its unique strengths to become a global leader in accelerating the digital public goods agenda. Discuss.

16. Beyond the headline goal of a $5 trillion economy, discuss the real priorities and values that should guide economic development for a truly prosperous and equitable society.

17. Balancing the short-term economic gains of mining with long-term environmental and social considerations remains a challenge. Comment.

18. Considering the environmental and health impacts of stubble burning, discuss the most promising and feasible solutions to effectively address this issue.

19. Despite the progress made, India still faces challenges in achieving TB elimination. What are the major hurdles remaining, and how can they be overcome?

20. Discuss the causes of fast depleting groundwater in India and also the measures taken by the Government in this regard.

21. In the face of the rising Antimicrobial Resistance threat, what are the most critical steps to be taken both at global and local level?

22. Addressing air pollution demands a multi-pronged approach with long-term policy interventions across various sectors. Discuss.

23. To what extent can Climate Smart Agriculture effectively address the interconnected challenges of food security, climate change adaptation, and greenhouse gas mitigation?

24. Despite increased awareness and pledges, what are the main bottlenecks hindering effective and equitable distribution of climate finance, and how can they be overcome to accelerate global climate action?

25. Given the challenges associated with an aging population, India should take efforts to prepare for its changing demographics. Analyze.

26. Solar mini-grids act as a cost-effective and sustainable solution for providing energy access and driving rural development in underserved regions. Discuss.

27. The lack of global regulations for companies developing spyware has led to their use by authoritarian governments to spy on political opponents. Discuss citing recent Supreme Court rulings.

28. Critically evaluate the evolving judicial interpretation of the discretionary powers of Governor and its impact on the Governor's role in the political system.