SIVARAJAVEL IAS ACADEMY
FOUNDER - DIRECTOR OF SMART LEADERS IAS

# TOPICS & POINTERS

## Exclusively For UPSC Mains 2022

# ENVIRONMENT AND DISASTER MANAGMENT

# GS-3

MAINS WORK BOOK


METIS 2022

Mentoring and Enabling Through Intelligent Support System

t.me/srvmetis

# TOPICS & POINTERS

## ABOUT

The material aims to equip the aspirants with enough knowledge to attempt mains questions by incorporating various dimensions. This material will be provided every week as per the test module.

## HOW TO READ THIS ?

1. Only key points will be provided .
2. Readers are advised to make a synopsis from topics and points given.
3. Make your own chart, diagrams and maps after reading the topics.
4. Understand the topics. Don't try to memorise them but link organically
5. Make sure to complete the module before the Test on Sunday.
6. Revise, Write, Practice- Repeat

t.me/srvmetis

## MAINS ANSWER WRITING CHALLENGE

Starting from 13th of June till the end of the test schedule every day two questions will be posted and answers may be provided in the evening.


SIVARAJAVEL IAS ACADEMY
FOUNDER - DIRECTOR OF SMART LEADERS IAS

HEAD OFFICE :
No.97, AF Block, 4th Avenue, 12th Main Rd.
Shanthi Colony, Anna Nagar, Chenna - 600 040.
✆ : 962636 4444 / 962636 9899

NELLAI BRANCH
No.106B, 3rd floor, Gilgal Complex,
Trivandrum Road, Palayamkottai - 627002.
✆ : 9626252500 / 9626253300

TRICHY BRANCH
No.143, 4th Floor, Lakshmi Complex,
Salai Road, Thillai Nagar, Trichy - 620018.
✆ : 9751500300/ 9786500300

# TOPICS AND POINTERS

## 2022- MAINS STUDY MODULE

## Environment

1. Circular economy - concept, importance, and need for India with examples
2. Climate induced migration
3. Agro-forestry & its socio-economic impact
4. Carbon Capture, Utilization and Storage technologies - background, utility and challenges
5. Climate Smart Agriculture
6. Green Hydrogen Policy
7. Recycling heat generated by datacentres
8. Human wildlife conflict
9. Hydropower in India: Balancing global carbon benefits with local environmental costs
10. Nutrient deficiency in Indian soils - CSE report
11. Organic and natural farming in india
12. Plastic Waste Management (Amendment) Rules, 2022
13. UNFCCC cop 26 - Important achievements and India's role
14. Agriculture emissions in India- sources, reasons, issues and initiatives taken
15. Blue-Green Economic Model of Development
16. National Mission on Biodiversity and Human Well-Being
17. Environment Tax
18. Nature-Based Solutions - concept and relevance to India
19. Carbon Farming



## Disaster Management

20. Disaster Management Basics - concept, stages in DM and evolving models
21. Disaster Risk Reduction - concept, need, Sendai Framework
22. Vulneravbility profile of India
23. kerala floods - causes, threat of urban flooding, links with climate change and way ahead
24. Flood Plain Zoning - concept, National Floodplains Zoning Policy and recent developments
25. Global Platform for Disaster Risk Reduction 2022 - relevance and outcomes
26. Coalition for Disaster Resilient Infrastructure (CDRI)
27. Disaster Management Plan of Ministry of Panchayati Raj
28. Coastal Vulnerability Index
29. Cyclone Management in India
30. Role of NGO and community organizations in disaster management

# TOPICS AND POINTERS

## 2022- MAINS STUDY MODULE

| Previous Year Questions on Biodiversity & Environment | |
|---|---|
| **2021** | 1. Explain the purpose of Green Grid Initiative launched at the World Leaders Summit of COP26 UN Climate Change Conference in Glasgow in November 2021. When was the idea first floated in the International Solar Alliance (ISA)?<br>2. Describe the key points of the revived Global Air Quality Guidelines (AQGs) recently released by the World Health Organisation (WHO). How are these different from its last update in 2005? What changes in India's National Clean Air Programme are required to achieve these revised standards?<br>3. Describe the major outcomes of the 26th session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC). What are the commitments made by India in this conference? |
| **2020** | 1. How does the draft Environment Impact Assessment (EIA) Notification, 2020 differ from the existing EIA Notification, 2006?<br>2. What are the salient features of the Jal Shakti Abhiyan launched by the Government of India for water conservation and water security?<br>3. Suggest measures to improve water storage and irrigation system to make its judicious use under the depleting scenario.<br>4. Describe the benefits of deriving electric energy from sunlight in contrast to conventional energy generation. What are the initiatives offered by our Government for this purpose?<br>5. What are the key features of the National Clean Air Programme (NCAP) initiated by the Government of India? |
| **2019** | 1. Coastal sand mining, whether legal or illegal, poses one of the biggest threats to our environment. Analyze the impact of sand mining along the Indians coasts, citing specific examples.<br>2. Define the concept of carrying capacity of an ecosystem as relevant to an environment. Explain how understanding this concept is vital while planning for the sustainable development of a region. |
| **2018** | 1. What are the impediments in disposing of the huge quantities of discarded solid wastes which are continuously being generated? How do we remove safely the toxic wastes that have been accumulating in our habitable environment?<br>2. What is a wetland? Explain the Ramsar concept of 'wise use' in the context of wetland conservation. Cite two examples of Ramsar sites from India.<br>3. Sikkim is the first 'Organic State' in India. What are the ecological and economical benefits of an Organic State?<br>4. How does biodiversity vary in India? How is the Biological Diversity Act,2002 helpful in the conservation of flora and fauna? |
| **2017** | 1. Not many years ago, river linking was a concept but it is becoming a reality in the country. Discuss the advantages of river linking and its possible impact on the environment.<br>2. 'Climate Change' is a global problem. How will India be affected by climate change? How Himalayan and coastal states of India will be affected by climate change? |

# TOPICS AND POINTERS

## 2022- MAINS STUDY MODULE

| | |
|---|---|
| **2016** | 1. Give an account of the current status and the targets to be achieved pertaining to renewable energy sources in the country. Discuss in brief the importance of the National Programme on Light Emitting Diodes (LEDs).<br>2. Rehabilitation of human settlements is one of the important environmental impacts which always attracts controversy while planning major projects. Discuss the measures suggested for mitigation of this impact while proposing major developmental projects.<br>3. The frequency of urban floods due to high-intensity rainfall is increasing over the years. Discussing the reasons for urban floods, highlight the mechanisms for preparedness to reduce the risk during such events. |
| **2015** | 1. The Namami Gange and National Mission for Clean Ganga (NMCG) programmes and causes of mixed results from the previous schemes. What quantum leaps can help preserve the river Ganga better than incremental inputs? |
| **2014** | 1. Should the pursuit of carbon credit and clean development mechanisms set up under UNFCCC be maintained even though there has been a massive slide in the value of carbon credit? Discuss with respect to India's energy needs for economic growth.<br>2. Environmental impact assessment studies are increasingly undertaken before the project is cleared by the government. Discuss the environmental impacts of coal-fired thermal plants located at Pitheads. |
| **2013** | 1. What are the consequences of Illegal mining? Discuss the Ministry of Environment and Forest's concept of GO AND NO GO zones for the coal mining sector.<br>2. Enumerate the National Water Policy of India. Taking river Ganges as an example, discuss the strategies which may be adopted for river water pollution control and management. What are the legal provisions of the management and handling of hazardous wastes in India? |

# TOPICS AND POINTERS

## 2022- MAINS STUDY MODULE

| Previous Year Questions on Disaster Management | |
|---|---|
| **2021** | 1. Discuss about the vulnerability of India to earthquake related hazards. Give examples including the salient features of major disasters caused by earthquakes in different parts of India during the last three decades. Describe the various causes and the effects of landslides. Mention the important components of the National Landslide Risk Management Strategy. |
| **2020** | 2. Discuss the recent measures initiated in disaster management by the Government of India departing from the earlier reactive approach. |
| **2019** | 1. Vulnerability is an essential element for defining disaster impacts and its threat to people. How and in what ways can vulnerability to disasters be characterized? Discuss different types of vulnerability with reference to disasters.<br>2. Disaster preparedness is the first step in any disaster management process. Explain how hazard zonation mapping will help disaster mitigation in the case of landslides. |
| **2018** | 1. Describe various measures taken in India for Disaster Risk Reduction (DRR) before and after signing 'Sendai Framework for DRR (2015-2030)'. How is this framework different from 'Hyogo Framework for Action, 2005'? |
| **2017** | 1. In December 2004, a tsunami brought havoc on 14 countries including India. Discuss the factors responsible for the occurrence of Tsunami and its effects on life and economy. In the light of guidelines of NDMA (2010) describe the mechanisms for preparedness to reduce the risk during such events. |
| **2016** | 1. With reference to the National Disaster Management Authority (NDMA) guidelines, discuss the measures to be adopted to mitigate the impact of recent incidents of cloudbursts in many places of Uttarakhand. |
| **2015** | 1. The frequency of earthquakes appears to have increased in the Indian subcontinent. However, India's preparedness for mitigating their impact has significant gaps. Discuss various aspects. |
| **2014** | 1. In 2012, the longitudinal marking of the high-risk areas for piracy was moved from 65° East to 78° east in the Arabian Sea by the International Maritime organisation. What impact does this have on India's maritime security concerns?<br>2. Drought has been recognized as a disaster in view of its party expense, temporal duration, slow onset and lasting effect on various vulnerable sections. With a focus on the September 2010 guidelines from the National disaster management authority, discuss the mechanism for preparedness to deal with the El Nino and La Nina fallouts in India. |
| **2013** | 1. How important is vulnerability and risk assessment for pre-disaster management? As an administrator, what are key areas that you would focus on in a Disaster Management System? |

| 1. | **Circular Economy** | |
|---|---|---|

- Circular economy is an economic system -> draws inspiration from bio-geophysical world, where the nutrients metabolized by life processes are generated from other living systems after their death & ensures stable, self-contained ecosystem.
- It involves sharing, leasing, reusing, repairing, refurbishing & recycling existing materials/products as long as possible => life cycle of products is extended.
- Looking beyond the current take-make-waste extractive industrial model -> circular economy aims to redefine growth, focusing on positive society-wide benefits.
- It is based on 3 principles:
  - Design out waste & pollution
  - Keep products & materials in use
  - Regenerate natural systems

**Need:**

- Rise in Population -> higher demand for goods & services -> leading to depletion of reserves.
- Supply of crucial raw materials is limited.
- Robust economic growth, rising household incomes, rising consumerism -> increased pressure on natural resources (such as land, forests, air, water & ecosystems).
- India's dependence on imports for critical resources (like rare earth minerals etc.).
- Traditional linear economy results in massive waste generation at all stages of a product life cycle.
- Extracting & using raw materials -> major impact on environment -> also increases energy consumption & $CO_2$ emissions.

**Benefits:**

- UNCTAD says => India could create as much as $200 billion in additional economic value by 2030 & $600 billion by 2050 -> by adopting circular principles across only 3 areas: cities & construction, food & agriculture, mobility & vehicle manufacturing.
- It will increase productivity.
- Has the potential to generate 1.4 crore jobs in 5-7 years & create lakhs of new entrepreneurs.
- Optimal resource use, energy savings & low GHGs emissions
- Consumers will also be provided with more durable and innovative products -> increase the quality of life & save their money in long run.

**Limitations:**

- Recovery & recycling of materials dispersed through pollution, waste & end-of-life product disposal -> require energy & resources.
- Utopian concept => Circular Economy analogy of a circle evokes endless perfection -> the analogy of scats evokes disorienting messiness.

| | | |
|---|---|---|
| | • Proponents of circular economy -> look at the world purely as an engineering system & overlooked the economic part of the circular economy.<br>• Invisible hand of market forces will conspire to create full displacement of virgin material of the same kind.<br>**Conclusion**<br>• Urgent need for gradually decoupling economic activity from the consumption of finite resources & designing waste out of the system.<br>• Underpinned by a transition to renewable energy sources -> the circular model builds economic, natural & social capital.<br>• Resource circularity is the need of the hour to implement the circular economy. | |
| **2.** | **Climate Induced Migration** | |
| | • As per International Organization of Migration (IOM) => Climate-induced migration is a movement of person/group -> due to sudden/progressive change in the environment because of climate change -> obliged to leave their habitual place of residence -> temporarily/permanently, within a State or across an international border.<br>• Climate-induced migration -> a singular type of environmental migration => change in environment is due to climate change. Therefore, climate migration is a subcategory of environmental migration.<br>**How climate change causes migration?**<br>• Intensification of natural disasters.<br>• Increased warming & drought -> affects agricultural production & access to clean water.<br>• Rising sea levels make coastal areas uninhabitable & increase the number of sinking island states. (44% of world's population lives within 150 KMs of coast).<br>• Competition over natural resources -> lead to conflict & in turn migration.<br>**Scale of climate-induced migration**<br>• World Economic Forum finds => Between 2008 and 2016 -> extreme weather events forced over 20 million people each year to become climate refugees.<br>• World Bank estimates => By 2050, 1.2 billion people could become environmental refugees (40 million in South Asia alone).<br>• India -> very vulnerable to climate-induced migration -> ranks 7th in Global Climate Risks Index, 2021.<br>• In 2018, environmental disasters caused over 2.7 million displacements.<br>• 45 million, in India alone -> will be forced to migrate from their homes due to climate disasters by 2050.<br>**Issues/Challenges**<br>Global, | |

- Lack of a clear definition relating to human migration in the context of climate change -> migration can be induced by a complex interplay of multiple factors of which climate change may only be one of them.
- UNHCR refused to grant these people 'refugee' status -> instead designating them as "environmental migrants," -> because it lacks the resources to address their needs.
- Persistent lack of data -> challenge to measuring the relation between migration & environment => while data collection on migration also a challenge.

**For India,**

- Sheer size of the country & levels of poverty -> provide fertile grounds for climate-induced migration.
- Rising rural distress & urban-centric nature of economic growth increases migration from rural to urban areas -> Climate change adds further push.

**Implications**

- Migrants lack representation and rights.
- Climate change is fuelling social conflicts => UNHCR finds that 80% of displaced people worldwide live in areas with acute food insecurity.
- Raising concerns on increasing human trafficking => UN Environment Programme estimates -> trafficking goes up by 20-30% during disasters.
- Rising sea-level -> disappearance of small island nations -> questions their territorial sovereignty & human rights of islanders who become stateless.

**Suggestions/measures**

Global,

- Invest in building local climate resilience & protecting community economies.
- Needs large pool of funds from advanced economies to support developing nations, facing the brunt of the climate crisis.
- Research is needed to improve the migratory process -> increasing migration monitors, providing safer modes of transport & consolidating/expanding destination country integration resources.

India,

- Respond climate-induced migration through a pragmatic mix of climate action & more inclusive development policies.
- In rural areas, support the livelihoods of people & strengthen social support systems.
- Invest in ecological infrastructure which safeguards local economic well-being.
- Public policy response requires creating more inclusive & resilient cities that provide poor migrants with dignified jobs & basic amenities -> to help them deal with climate shocks.

**Conclusion**

| | | |
|---|---|---|
| | • World needs to act swiftly to develop an international framework dealing with climate-induced migration -> so that people forced to move because of climate change stay protected. | |
| **3.** | **Agro-forestry & its socio-economic impact** | |
| | • Agroforestry => land-use systems/technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops & animals in some form of spatial arrangement/temporal sequence.<br>• There are both ecological & economical interactions between different components.<br>• Agroforestry is currently practised on 13.5 million hectares in India, but its potential is far greater.<br>• Already an estimated 65 % of the country's timber and almost half of its fuel wood come from trees grown on farms.<br>• 3 main types of agroforestry systems:<br>i. Agri-silvicultural systems => combination of crops/trees -> such as alley cropping or home gardens.<br>ii. Silvopastoral systems => combine forestry & grazing of domesticated animals on pastures, rangelands or on-farm.<br>iii. Agro-silvopastoral systems => 3 elements -> trees, animals & crops can be integrated.<br>**Benefits of AgroForestry**<br>• Agroforestry is crucial to smallholder farmers & other rural people -> because it can enhance their food supply, income & health.<br>• They are multifunctional systems -> provide wide range of economic, sociocultural & environmental benefits.<br>• Produces food/fuel/fibre, contributes to nutritional security, sustains livelihoods, helps prevent deforestation, increases biodiversity, protects water resources & reduces erosion.<br>• Means to reduce rural unemployment, with timber production on farms currently generating 450 employment days/hectare/year in India.<br>• Climate change mitigation/adaptation benefits of agroforestry.<br>**Adverse effects**<br>• Market-oriented trees are preferred which damage the ecosystem. Instead of Poplar & eucalyptus -> farmers should plant neem, Mahua, Arjun & Acacia.<br>• Fuelwood and fodder trees are generally neglected.<br>• Exotic varieties are soil-moisture & water exhaustive -> resulting in adversely affecting groundwater table.<br>• Land under agroforestry become unproductive as the roots of the tree become so dense that they need intensive labour for their removal. | |

| | | |
|---|---|---|
| | • Trees become habitat for many pests and diseases which affect the crops.<br>• In the field where the trees are planted the productivity per unit area decreases.<br>**Way forward**<br>• Sector needs to be institutionally bolstered and profiled from the perspective of its utility spectrum that knits farm-forestry, environmental protection, and sustainable development.<br>• Financial support should be provided to all small landholders, rather than only Scheduled Caste and Scheduled Tribe farmers.<br>• Farmer collectives — cooperatives, self-help groups, Farmer -Producer Organisations (FPOs) — must be promoted for building capacities to foster the expansion of tree-based farming and value chain development.<br>• Amending unfavourable legislation and simplifying regulations related to forestry and agriculture.<br>• Scientists and researchers can develop location-specific tree-based technologies that complement the crop and livestock systems for sustainable livelihoods, gender concerns & incorporate feedback from local communities. | |
| **4** | **Carbon Capture, Utilization and Storage technologies -** | |
| | – Carbon Capture, Utilization, and Storage (CCUS) encompasses methods and technologies to remove CO2 from the flue gas and from the atmosphere,<br>– followed by recycling the CO2 for utilization and determining safe and permanent storage options.<br>– Various approaches have been conceived for permanent storage<br>– gaseous storage in deep geological formations (including saline formations and exhausted gas fields), and solid storage by reaction of CO2 with metal oxides to produce stable carbonates.<br>– Today, CCUS facilities around the world have the capacity to capture more than 40 MtCO2 each year. CO2 captured using CCUS technologies are converted into fuel (methane and methanol), refrigerants and building materials.<br>**Applications of CCUS:**<br>– Carbon neutral fuel→playing a crucial role in climate change mitigation<br>– Combining Co2 with steel slag to make construction materials compatible with Paris goals (would be more beneficial with respect to Indian real estate sector)<br>– Enhanced oil and gas recovery<br>– CCUS technologies can play an important role in meeting net zero targets, including as one of few solutions to tackle emissions from heavy industry and to remove carbon from the atmosphere.<br>**Challenges:** | |

| | | |
|---|---|---|
| | – Carbon capture involves the development of sorbents which is expensive.<br>– new infrastructure costs and unreliable policy decisions poses a bigger challenge in effective implementation of CCUS. | |
| **5** | **Climate Smart Agriculture** | |
| | Climate-smart agriculture (CSA) is an approach for transforming and reorienting agricultural production systems and food value chains so that they support sustainable development and can ensure food security under climate change.<br>Climate-smart agricultural systems include different elements such as:<br>• the management of land, crops, livestock, aquaculture and capture fisheries to balance near-term food security and livelihoods needs with priorities for adaptation and mitigation;<br>• ecosystem and landscape management to conserve ecosystem services that are important for food security, agricultural development, adaptation and mitigation;<br>• services for farmers and land managers that can enable them to better manage the risks and impacts of climate change and undertake mitigation actions; and<br>• changes in the wider food system including demand-side measures and value chain interventions that enhance the benefits of climate-smart agriculture.<br>**Significance:**<br>• sustainably increase agricultural productivity and incomes;<br>• adapt and build resilience to climate change<br>• reduce and/or remove greenhouse gas emissions, where possible.<br>The climate-smart agriculture approach seeks to reduce trade-offs and promote synergies to make crop and livestock systems, forestry, and fisheries and aquaculture more productive and more sustainable.<br>**Way forward**<br>Farmers will need to be supported both technically and financially to adopt CSA. Multilateral lending institutions and private sectors should be encouraged to play an important role in CSA. | |
| **6** | **Green Hydrogen Policy** | |
| | – Under the policy, the government is offering to set up manufacturing zones for production, connectivity to the ISTS (Inter-State Transmission System) on priority basis, and free transmission for 25 years if the production facility is commissioned before June 2025. This means that a green hydrogen producer will be able to set up a solar power plant in Rajasthan to supply renewable energy to a green hydrogen plant in Assam and would not be required to pay any inter-state transmission charges.<br>**The policy provides as follows :**<br>• Green Hydrogen / Ammonia manufacturers may purchase renewable power from the power exchange or set up | |

renewable energy capacity themselves or through any other, developer, anywhere.

- Open access will be granted within 15 days of receipt of application.
- The Green Hydrogen / Ammonia manufacturer can bank his unconsumed renewable power, up to 30 days, with distribution company and take it back when required.
- Distribution licensees can also procure and supply Renewable Energy to the manufacturers of Green Hydrogen / Green Ammonia in their States at concessional prices which will only include the cost of procurement, wheeling charges and a small margin as determined by the State Commission.
- Waiver of inter-state transmission charges for a period of 25 years will be allowed to the manufacturers of Green Hydrogen and Green Ammonia for the projects commissioned before 30th June 2025.
- The manufacturers of Green Hydrogen / Ammonia and the renewable energy plant shall be given connectivity to the grid on priority basis to avoid any procedural delays.
- The benefit of Renewable Purchase Obligation (RPO) will be granted incentive to the hydrogen/Ammonia manufacturer and the Distribution licensee for consumption of renewable power.
- To ensure ease of doing business a single portal for carrying out all the activities including statutory clearances in a time bound manner will be set up by MNRE.
- Connectivity, at the generation end and the Green Hydrogen / Green Ammonia manufacturing end, to the ISTS for Renewable Energy capacity set up for the purpose of manufacturing Green Hydrogen / Green Ammonia shall be granted on priority.
- Manufacturers of Green Hydrogen / Green Ammonia shall be allowed to set up bunkers near Ports for storage of Green Ammonia for export / use by shipping. The land for the storage for this purpose shall be provided by the respective Port Authorities at applicable charges.

**Significance:**

India's largest oil refiner, Indian Oil Corp (IOC) estimates that GHP measures will reduce the cost of green hydrogen production by 40-50%. Fuels like Green Hydrogen and Green Ammonia are vital for any nation's environmentally sustainable energy security. India has already committed to achieving net-zero carbon emissions by 2070, and green hydrogen will play a significant role as a disruptive feedstock in India's transition from oil and coal.

**Challenges:**

***Charges on Transmission***: Producing 1kg of green hydrogen takes about 50kWh of electricity (with electrolyser efficiency of 70%).

***Reluctance of States***: Many public sector electricity utilities are unwilling to let go of their monopoly in power distribution. The

| | | |
|---|---|---|
| | RE-rich states are either moving away from allowing RE banking or introducing regulations to restrict this facility.<br>***Lesser Margins for Producers***: The GHP omits to mention any waiver of ISTS losses for green hydrogen and ammonia projects.<br>**Way Forward:**<br>The measures announced in the GHP would require the active cooperation of state governments (including allotment of land in RE parks and proposed manufacturing zones) and the relevant SERCs. The Centre may consider incentivizing petroleum refiners and fertiliser makers to make and use green hydrogen by offering subsidies linked to their level of its utilisation as feedstock.<br>This would further India's goal of achieving its net-zero emissions target by 2070. | |
| **7.** | **Recycling heat generated by datacentres** | |
| | **Intro**<br>– Microsoft has partnered with Fortum, Finnish energy company to launch the world's largest scheme to provide heat to homes, services and business in Finland with waste heat.<br>– Heat would be sourced from a new data centre region that Microsoft has planned to build in the Helsinki metropolitan area in Finland.<br><br>**How will this work?**<br>– First, excess heat generated by the data centre is captured.<br>– It is transferred from the server cooling process to the district heating system which is a centralised location that captures heat.<br>– The heat is then distributed from the district heating system to buildings for residential and commercial heating needs.<br><br>**What is a data centre?**<br>– A data centre is an organization's physical facility located in a dedicated building. It comprises computers servers, storage systems, etc. which are used to store the data, critical applications and data etc.<br>– These data centres consume large amounts of energy. Therefore, these physical facilities have temperature controls and energy efficiency systems.<br>– Around 75% of the electricity that is consumed by a data centre becomes waste heat.<br>– Therefore, a data centre can be used to heat up to 85 degrees Fahrenheit in the winter season, similar to a gas boiler.<br><br>**What's the scale of their carbon footprint?**<br>• On a global level, data centres consume more than 1% of the world's total electricity. Therefore, according to the International Energy Agency (IEA), they contribute to 0.3% of all global CO2 emissions.<br>• As per Ireland's energy regulator, the data centres located in Ireland could use almost 30% of the country's electricity by 2027. Therefore, they are going to endanger the climate goals. | |

**Why is recycling waste heat important?**

- It can provide clean heat or climate friendly waste heat to homes, businesses and public buildings in the cities, for example Microsoft aims to provide it in the Helsinki.
- It can help the countries and cities reach their CO2 emission reduction targets. For example, it can reduce dependence on the coal-fired heat unit in the cities.

**Other countries and companies recycle waste heat from data centres**

Datacentres thrive in cold climates. Therefore, recycled waste heat systems are used for district heating in the Nordic and Baltic countries, as well as in Russia and China.

- Facebook is implementing a project in Odense, Denmark.
- Apple is planning such a project in Denmark.
- H&M has been distributing waste heat to nearby homes in Denmark since 2013.
- An IBM data centre in Switzerland is heating a nearby community pool.

In Canada, Quebecor donates its heat to the editorial office of a local newspaper.

## 8. Human Wildlife Conflict

**Intro**

The IUCN Species Survival Commission (SSC) Human-Wildlife Conflict & Coexistence Specialist Group defines human-wildlife conflict as: *Struggles that emerge when the presence or behaviour of wildlife poses an actual or perceived, direct and recurring threat to human interests or needs, leading to disagreements between groups of people and negative impacts on people and/or wildlife.*

**Reasons**

Human-wildlife conflicts are becoming more frequent, serious and widespread because of

- ✓ human population growth,
- ✓ agricultural expansion
- ✓ infrastructure development
- ✓ climate change
- ✓ other drivers of habitat loss

**Importance of managing the conflict**

- Healthy ecosystems and the vital services
- Managing human-wildlife conflicts is therefore crucial to achieve the UN Vision for Biodiversity 2050 in which 'humanity lives in harmony with nature and in which wildlife and other living species are protected'.
- Human-wildlife conflicts have severe implications for communities' livelihoods, safety and wellbeing, and risk undermining conservation efforts by eroding support for protected areas, wildlife and biodiversity.
- Retaliation against wildlife can pose a serious threat to a species' survival, and reverse previous conservation progress.

**Government Initiatives**

- Wildlife (Protection) Act, 1972.

| | | |
|---|---|---|
| | • A network of Protected Areas has been created all over the country under the Wild Life (Protection) Act, 1972<br>• Odisha's Forest Division has started casting seed balls (or bombs) inside the reserve forest areas to augment the availability of food in the forest areas.<br>• SMS Alert System in Kerala through a mobile App, called 'Wild Watch' has been developed to mitigate man-animal.<br>• It consists of an early warning system, public SMS alert, real-time monitoring etc.<br><br>**Way Forward**<br>– Measures that can be taken to reduce the damage or impacts, de-escalate tensions, address risks to income and poverty, and develop sustainable solutions include<br>✓ Barriers (fences, nets, trenches)<br>✓ Guarding and early-warning systems<br>✓ Deterrents and repellents (sirens, lights, beehives) translocation (moving wildlife)<br>✓ Compensation or insurance<br>✓ Providing risk-reducing alternatives<br>Managing tensions between stakeholders involved in these situations | |
| **9.** | **Hydropower in India: Balancing global carbon benefits with local environmental costs** | |
| | **Hydropower in India**<br>– In 1947, hydropower capacity in India - about 37 percent of the total power generating capacity - over 53 percent of power generation.<br>– In the late 1960s, growth in coal-based power generation initiated the decline in hydropower's share in both capacity and generation.<br>– In 2022, hydropower capacity of 46,512 MW (megawatts) accounted for roughly 11.7 percent of total capacity.<br>**Global benefits**<br>• In 2020, hydropower - 4,370 Terawatt-hours (TWh) of global electricity generation - the highest contribution by a renewable and low carbon energy resource.<br>• Makes the largest low carbon energy contribution to the global primary energy basket - 55 percent higher than that of nuclear power and larger than all other renewable energy (RE) combined.<br>• Hydropower plants can also be stopped and restarted relatively smoothly.<br>**Local Environmental costs:**<br>• Twelve projects of total capacity of over 3,500 MW have either been terminated or held up due to local environmental concerns.<br>• Forty projects of capacity 13633 MW have either been abandoned or delayed due to local opposition to the projects rooted in local environmental concerns. | |

- In the last few years, many of India's newer hydro-power projects on the Himalayan rivers have been damaged by floods and landslides.
- High precipitation in the Himalayas, coupled with the sudden fall in altitude in the mountains of that region results in large volume of water gushing down river channels.
- Construction of hydro projects and related infrastructure such as roads often aggravate this phenomenon.

**Challenges**

- Highly capital-intensive mode of electricity generation.
- Barring a few small projects in central and southern India, most are in the North and North-eastern states.
- This means reinvigoration of local agitations over environmental compromises.
- This is justified given that the massive flash floods in Uttarakhand in 2013 caused 5000 deaths, destroyed homes and damaged hydropower projects.
- The 12th plan cautioned that "hydro-power projects on the Himalayan Rivers may not be viable even if they are looked at from a narrow economic perspective".
- The Himalayas are relatively young mountains with high rates of erosion. There is little vegetation in the upper catchment to bind soil.
- High sediment load reduces productive life of power stations through heavy siltation.

**Government's Push for Hydropower:**

- Inclusion of large hydro power projects as RE sources.
- Hydro-purchase obligation (HPO) as a separate category in the non-solar renewable purchase obligation (RPO).
- Tariff rationalization measures including providing flexibility to the developers to determine tariff.
- Increasing debt repayment period to 18 years, and introduction of escalating tariff of 2 percent.
- Budgetary support for funding flood moderation component of hydropower projects on case-to-case basis for enabling infrastructure

**Way Forward**

- Local environmental concerns cannot be dismissed as environmental fundamentalism or anti-developmentalism.
- The trade-off between the local and global environmental benefits of hydropower are real. The costs are local, and the benefits are global and to some extent national.

It is important that the government policy, in its enthusiasm to contribute to the global public good of carbon reduction, does not ignore the cost imposed on the local environment and populations dependent on it.

| 10 | **Nutrient Deficiency in Indian Soils- CSE Report** | |
|---|---|---|
| | Report released by the Centre for Science and Environment→most Indian soils are deficient in organic carbon and macronutrients.<br><br>**Highlights:**<br>– 27 states and UTs had nitrogen deficiency in 90% of the samples<br>– 85% of samples in Organic Carbon<br>– Soils were deficient in **micronutrients** like **boron, zinc, iron and Sulphur around 40%**<br>– The levels of organic carbon and macronutrients in Indian soils are either "very low", "low" or "medium".<br>**Reasons:**<br>– Farming practices →tilling breaks up the soil & destroy its natural structure, killing vital bacteria.<br>– Agricultural chemicals alter the physiological, metabolic and biochemical behavior of microbiota in the soil.<br>– Decreasing nutrient bioavailability.<br>– Pressures of population growth, food insecurity and agricultural intensification<br>– Burning of crop residues<br>– Land misuse and soil mismanagement<br>– Climate change<br><br>**Steps to be taken:**<br>– Replenishment of soil<br>– **Organic practice:** application of organic fertilisers and practices like growing green manure crops or mulching & Biofertilizers<br>– Some other practices that help regain nutrients include:<br>o **inter-cropping**<br>o **mixed cropping**<br>o **Practicing crop rotation**<br>o **Agroforestry** involves growing crops around trees & other plants as hedges.<br>o **Permaculture**<br>• Alternative crops like pulses can be grown<br>• Climate smart agriculture. Area specific farming practices | |
| **11** | **Organic and Natural Farming in India** | |
| | Unsustainability of conventional agriculture production and the damage caused to ecology has led to the rise in demand for new sustainable practices.<br><br>**Various models:**<br>**Organic Farming:**<br>– Organic fertilizers and manures like compost, vermicompost are added from external sources<br>– Basic agri practices like tilling, ploughing required<br>– Still expensive due to bulk requirements of manures | |

**Zero Budget Natural Farming:**

- No **external** chemicals/organic fertilizers are added to the soil.
- Decomposition of organic matter by microbes on soil surface itself
- No ploughing/tilling & no weeding needed
- Involves zero cost as every inputs are from the same field

**Need:**

- Synthetic fertilizers destroy soil organisms damaging rhizobia that fix nitrogen
- The long term effect→reduction of crop yields. The damaged soil→easily eroded by wind and water.
- The eroding soil needs high quantities of fertilizers, later washed/leached into surface and underground water sources
- The consumers→increasingly concerned about the quality & food safety
- Mycotoxin contamination, pesticide residues and environment degradation-- issues
- Climate change

**Govt Initiatives:**

- Paramparagat Krishi Vikas Yojana (PKVY) and
- Mission Organic Value Chain Development in North East Region (MOVCDNER)
- National program for Organic Production
- Capital Investive Subsidy scheme-under Soil Health Management scheme
- National Mission on Oilseeds and Oilpalm for organic farming

**Constraints:**

- Mere regulation making will amount to nothing ,unless a clear direction is available from the Centre to the Panchayat levels,
- Lack of awareness and willingness on part of the farming community
- Inability to obtain a premium price→ a setback.
- Not sure whether all nutrients of required quantities be made available by organic materials
- State governments yet to formulate policies and a credible mechanism to implement them.
- Infrastructure facilities for verification leading to certification of the farms are inadequate.
- Costs of the organic inputs are higher than those of industrially produced chemical fertilizers
- Small and marginal farmers can't take the risk of low yields for initial 2-3 years on the conversion
- Vested interests- Fertilizer industries etc oppose

**Way Forward:**

| | | |
|---|---|---|
| | – Need for fixing standards and quality parameters for biofertilizers and biomanures.<br>– Awareness creation through movies and various other communication media.<br>– Implementation of programs upto grassroot level<br>– Strengthen agri market infrastructure. | |
| **12** | **Plastic Waste management (A) rules- 2022** | |
| | **Highlights of the new rules:**<br><br>• **EPR (Extended Producer Responsibility) guidelines (introduced in 2016 guidelines)**<br>• **Prohibition** of **single-use plastic item**s, **having low utility & high littering** potential.<br>• Classification of plastics into 4 categories<br>• Mandate recycling and reusing a certain percentage of plastic produced by manufacturers, importers and brand owners<br>• A **centralized online portal** by CPCB for registration & f**iling of annual returns by producers**, importers and brand-owners,<br>• Environmental compensation levied based on **polluter pays principle**, with respect to non-fulfilment of EPR targets by producers, importers.<br><br>**Significance:**<br><br>• Important step for **reducing pollution caused due** to littered plastic waste.<br>• Provides framework to **strengthen the circular economy** of plastic packaging waste,<br>• Promote development of new alternatives to plastics & provide steps for moving towards sustainable plastic packaging<br>• The **EPR guidelines**- formalization and further development of the plastic waste management.<br><br>**Way Ahead**<br><br>• Blanket ban cannot be solution.<br>• It is vital for government, to stay the course, cut the amount of plastic it uses and rapidly transition to a circular economy.<br>• Govt ministries at the national and l**ocal levels must collaborate** including participation from industrial firms, non-governmental organizations and volunteer organizations.<br>• Promoting alternative materials or reused and recycled plastics are necessary. | |

| 13. | **UNFCCC CoP 26 - Important achievements and India's role** | |
|---|---|---|

UN Framework Convention on Climate Change (UNFCCC). → Glasgow summit
Important climate summit after Paris agreement 2015

**Achievements -**

- Targeted global warming not to exceed +1.5°C
- Urged countries to adopt **Net zero timelines**
- **Glasgow Breakthrough Agenda** –(Outside COP) - a cooperative effort to accelerate the development and deployment of clean technologies in sectors such as power, transport, steel etc., ( with goals for 2030) → example – Climate Group's Steel Zero initiative, RE100, Green Grids Initiative
- New commitments to **phase out or phase down coal power** (23 nations committed to phase out)
- Defined **global goal on adaptation**
- Finalization of **guidelines** for the full implementation of the **Paris Agreement**;
- Compromise on **Article six of Paris Agreement** (Related to Carbon markets)
- Finalization of negotiations on the **Enhanced Transparency Framework**
- **Global Methane Pledge**

**India's Role**
**Goals →**
**Panchamirth – Five nectar elements** – India's NDC

- Reach 500 GW Non-fossil energy capacity by 2030.
- 50 per cent of its energy requirements from renewable energy by 2030.
- Reduction of total projected carbon emissions by one billion tonnes from now to 2030.
- Reduction of the carbon intensity of the economy by 45 per cent by 2030, over 2005 levels.
- Achieving the target of net zero emissions by 2070.

India discussed **principles of equity, and common but differentiated responsibilities and respective capabilities**

**Actions →**

- **International Solar Alliance**
- **'LIFE'– 'Lifestyle for Environment'** → a mass movement → live a lifestyle that is in tune with our planet and does not harm it.
- **Infrastructure for Resilient Island States (IRIS)**
- **Coalition for Disaster Resilient Infrastructure (CDRI)**
- **National Green Hydrogen Policy**
- Product linked Incentive Schemes for Renewable energy sector

Net Zero target by 2030 by Indian Railways

| 14. | **Agriculture emissions in India- sources, reasons, issues and initiatives taken** | |
|---|---|---|

**Agricultural emission in India-**

Agri - a prominent source of GHGs ($CO_2$, $CH_4$, $N_2O$).
agriculture, forestry and land use sectors - 14% of the total emissions of India
Brazil, Indonesia and India were the top three emitters, contributing nearly 30 percent to global agriculture emissions

**Sources →**

Land use conversion, decomposition of soil organic matter (SOM), biomass burning, rice paddy cultivation, enteric fermentation in livestock, manure management, fertilizer use, and fuel consumption for farm operations (e.g., plowing, spraying, harvesting, grain drying). Manufacturing of farm inputs, including fuel, electricity, machinery, fertilizer, pesticides, seeds, plastics, and building materials

**Reasons →**

- Unsustainable agriculture – growing population – Increased use of fertilizers
- Input intensive agricultural systems
- Increased livestock population
- Mechanization of agriculture
- Discrepancies in agricultural marketing system and pricing system → lack of diversification of agri products

**Underlying Issues→**

- Agriculture becoming a source of emissions rather than a sink
- Inequalities in food security may accentuate
- Lack of Political will in addressing efficient water and power usage subsidies in agriculture
- Lack of climate centric behaviour in agricultural practices (eg. Stubble burning) and lack of monetary and policy support to adopt new practices

**Initiatives Taken →**

- MSP focused on diversifying agricultural production to water efficient crops such as millets etc., and Rashtriya Krishi Vikas Yojna
- Regulation of fertilizer usage –Streamlining Fertilizer usage through authorisation by aadhar
- System of Rice Intensification (SRI)
- Direct Seeding of Rice Techniques
- Zero tillage
- Zero budget natural farming
- Agro forestry
- Use of efficient water management techniques – drips, sprinklers – PM Krishi Sinchayee Yojana
- Use of neem coated urea, nano urea

| | | |
|---|---|---|
| | • Integrated farming techniques to reduce emissions from livestock<br>• Balanced feeding to animals<br>• National innovations in Climate Resilient Agriculture (NICRA)<br>• National Mission for Sustainable Agriculture<br>• Carbon Credit trading for farmers – initiative of IARI with private firm | |
| **15.** | **Blue-Green Economic Model of Development** | |
| | – **Green economy** strategies tend to focus on the sectors of energy, transport, sometimes agriculture and forestry, SDG GOAL 7: Affordable and Clean Energy—SDG GOAL 15: Life on Land<br>– The **blue economy** focuses on fisheries sectors and marine and coastal resources. --- Sustainable Development Goal 14 Life Below Water - Ministry of Jal shakthi nodal ministry in India<br>– Both incorporate strategies to address climate mitigation and adaptation. UNEP and other international organizations **extract blue economy from green economy**. They encourage to tackle climate change via low-carbon and resource-efficient shipping, fishing, marine tourism, and marine renewable energy industries<br>– **No blue without green - nor green without blue** - Not only was terrestrial life spawned from the seas, but geological 'blue' carbon sequestration. Its centrality to the oceans are responsible for our continued survival. Without oceans, life on earth would cease to exist<br>– The **circular economy** is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended.<br>– India must club its ongoing green efforts with the 'blue economy' to create a blue-green economic agenda.<br><br>Three Fundamental Pillars—climate change, health and urban resilience<br>**Merits**<br>– Sustainable development – Reduce emissions per GDP percent – Green jobs – Social inclusion – equitable access to natural spaces – Improvement of health, environment, -- Sustainable urban spaces – sustainable land use – Conservation of the marine resources and coastal spaces for efficient and environment friendly development – Disaster resilience – resilience to growing population – Ecological perspective in every development prospects – Efficient water management and water treatment facilities. - potential to avert and mitigate climate emergencies- Potential to change urban planning approach – Democratic decision making in planning – | |

| | | |
|---|---|---|
| | Multi sectoral work flow reduces red tapism in urban works. – Poverty alleviation<br><br>**Blue – Green Model initiatives**<br>• Swachh Bharat Mission<br>• Smart Cities Mission<br>• Climate Smart Cities Assessment Framework<br>• Atal Mission for Rejuvenation and Urban Transformation<br>• Pradhan Mantri Awas Yojana – usage of renewable resources or alternative material (fly ash etc) in the construction material<br>• National Action Plan on Climate Change (NAPCC) - macroeconomic, sustainability and poverty reduction implications of green investment in sectors like renewable energy and sustainable agriculture, and also provided guidance on catalysing increased investment in these areas.<br>• Blue – Green cities – Delhi, Bhopal, Madurai and Banglore -- including blue-green components in their master or action plans, with the aim of enhancing existing natural blue systems in the city and the surrounding public spaces through a planned strategy.<br><br>**Way Forward →**<br>– New but rapidly adopted across the world – Need to adopt swiftly—integrated comprehensive approach needed rather than scattered approach | |
| **16** | **National Mission on Biodiversity and Human Well-Being (NMBHWB)** | |
| | **Need for such a mission :**<br>• Lost 7% intact forests since 2000,(Globally)<br>• A million species might be lost forever during the next several decades.<br>• Climate change<br>• Global warming and Globalization<br>• Framing of governmental policies at the biodiversity level ( “one health “)<br>**Key features of National Mission on Biodiversity and Human Well-Being (NMBHWB)**<br>• The Mission will strengthen the science of restoring, conserving, and sustainably utilising India’s natural heritage –**Sustainable Utilization**<br>• The mission will embed biodiversity as a key consideration in all developmental programmes, particularly in agriculture, ecosystem services, health, bio-economy, and climate change mitigation;-**For integrated development**<br>• It will establish a citizen and policy-oriented biodiversity **information system**<br>• **Commitment to international commitments :** | |

| | | |
|---|---|---|
| | ○ Realisation of India's national biodiversity targets,<br>○ UN Sustainable Development Goals (SDGs)<br>○ commitments under the new framework for the Convention on Biological Diversity (CBD)<br>• **Leadership role**: The Mission will allow India to emerge as a leader in demonstrating linkage between conservation of natural assets and societal well-being.<br>• Mission programmes will offer **nature-based solutions** to numerous environmental challenges, including degradation of rivers, forests, and soils, and ongoing threats from climate change, with the goal of creating climate-resilient communities.<br>• Mission's **"One Health" programme**, integrating human health with animal, plant, soil and environmental health, has both the preventive potential to curtail future pandemics along with the interventional capability for unexpected public health challenges. | |
| **17** | **Environment Tax** | |
| | **Environment Tax & Benefits**<br>**Need of Environmental tax :**<br>○ To curb or reduce the extent and amount of the use or consumption of harmful substances or activities, or depletion of a resource.<br>○ Environment is also a public good which can be subjected to tax<br>**Environmental tax and its complementary effects :**<br>○ Eliminating existing subsidies and taxes that have a harmful impact on the environment.<br>○ Restructuring existing taxes in an environmentally supportive manner.<br>○ Initiating new environmental taxes.<br>**Intended Benefits:**<br>○ **Environmental:** It can induce appropriate environmental decisions by raising the relative costs of polluting inputs and outputs and thereby correcting the negative externalities of a polluting activity.<br>○ **Fiscal:** Environmental tax reforms can mobilise revenues to finance basic public services when raising revenue through other sources proves to be difficult or burdensome.<br>**Status of Environmental Tax in India**<br>○ Forest Conservation Act, 1980, any entity that diverts forest land for non-forest purposes is required to provide **financial compensation for the purpose of afforestation** in non-forest or degraded land.<br>○ **a Compensatory Afforestation Fund (CAF)** should be created to manage the funds generated.<br>○ India's Clean Environment Cess or coal cess acts as **a carbon tax.**<br>○ **The coal cess** is levied on coal, lignite and peat .<br>**Challenges in Environmental Tax :** | |

| | | |
|---|---|---|
| | ○ **Inflationary Effect:** Environmental regulations may have significant costs on the private sector in the form of slow productivity growth and high cost of compliance.<br>○ **Diversion of Funds:** A large part of taxes raised for environmental purposes are being diverted or lying unutilized.<br>○ **Affecting Competitiveness:** The adding of costs to a producer within one country or region, that is not imposed on producers outside that country or region, may of course impact on the competitiveness of the local producer. | |
| **18** | **Nature-based Solutions (NbS)** | |
| | – **Nature-based Solutions (NbS)** – IUCN- "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.<br>– NbS builds resilience of the underserved and vulnerable urban communities who are most affected by climate change induced catastrophes.<br>**Types Of NbS:**<br>– **No or minimal intervention in ecosystems.**<br>– Examples include **the protection of mangroves in coastal areas** to limit risks associated with extreme weather conditions and provide benefits and opportunities to local populations.<br>– **Some Interventions in Ecosystems and Landscapes:**<br>– This type of NBS is strongly connected to concepts like natural systems agriculture, agro-ecology, and evolutionary-oriented forestry.<br>– **Managing Ecosystems in Extensive Ways:**<br>– It is linked to concepts like green and blue infrastructures and objectives like restoration of heavily degraded or polluted areas and greening cities.<br>– **India and NBS:**<br>– India launched its first **National Coalition platform for Urban nature**-based solutions (NbS) under the **Cities4Forests initiative**. | |

| 19 | **Carbon farming** | |
|---|---|---|

- Carbon farming (also known as **carbon sequestration**) is a system of agricultural management that **helps the land store more carbon** and **reduce the amount of GHG** that it releases into the atmosphere.
- It involves practices that are known to improve the rate at which $CO_2$ is removed from the atmosphere and converted to plant material and soil organic matter

**Methods for Carbon Farming**

- **Forest Management**: Healthy forests absorb and hold $CO_2$ emissions produced from other sources
- **Grasslands Conservation**:
- **Mixed Farming**
- **Using Cover Crops**:
- **Reduction of Soil Tillage**
- **Wetland Restoration**:

**Significance of Carbon Farming**

- **Multidimensional Benefits**:
- Increasing Soil Organic Carbon (SOC) through various methods can **improve soil health, agricultural yield, food security, water quality**, and reduce the need for chemicals
- **Offsets Carbon Emissions**
- **Acts as an Intermediate Mitigation Strategy**: Increasing soil carbon offers a range of co-benefits along with buying the time before other technologies can help the world transition to a **zero-carbon** lifestyle.
- **Helps Restoring Carbon Cycle**
-



**Challenge Associated**

- **Requires Participation at a Larger Level**:
- For the overall framework of carbon farming to be successful, it would have to **include sound policies**, **public-private partnerships**, accurate quantification methodologies and **supportive financing** to efficiently implement the idea.
- **Limited Benefit**:
- The areas with long growing seasons, sufficient rainfall and substantial irrigation make viable opportunities for carbon farming.

**Way Forward**

**Direct Incentives for Farmers:** The land sector is key for reaching a climate-neutral economy, because it can capture $CO_2$ from the atmosphere.

**Carbon Credits and Carbon Banks**:

| | | |
|---|---|---|
| | – The farmers can be rewarded through globally tradable **carbon credits** and '**carbon banks**' can also be created that would **buy and sell carbon credits from farmers**<br>**Organic-Carbon Rich Fertilisers:**<br>– Fertilisers such as compost and **solid manure with wide C:N (carbon:nitrogen) ratios** will have a **slow carbon turnover** compared to other materials.<br>**Biofuel over Fossil Fuels:** Nearly all biofuel systems (mainly biodiesel and bioethanol) produce fewer GHG emissions than fossil fuels | |

| 20 | **Disaster Management- Stages** | |
|---|---|---|

**Disaster Management Act 2005 Defines:**

- Disaster means a **catastrophe, mishap, calamity** or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial **loss of life or human suffering** or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to **be beyond the coping capacity** of the community of the affected area.


The following Stages of DM as defined under the DMA 2005

- Prevention of danger disaster→mitigation of risk→capacity-building;→preparedness→prompt response→assessing the severity evacuation→rescue and relief;→rehabilitation and reconstruction;

**Administrative structure:**

- NDMA→ National Executive Committee→ State DMA→ District DMA
- National Disaster Response Force (NDRF)
- National Disaster Plan→ State and District Plan needs to be made and updated

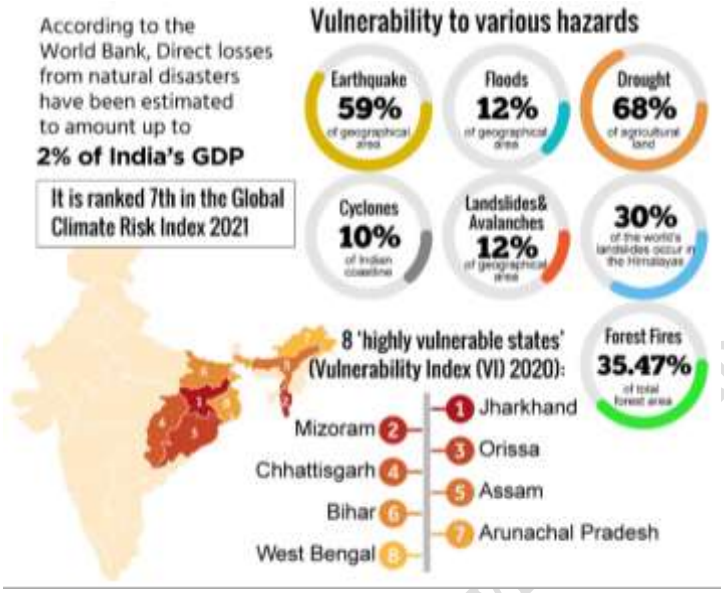
India Invoked the DMA 2005 during Covid-19, Revoked in March 2022→ Better convergence and flow of command

**Some Best Practices:**

- iFLOWS- Mumbai, a state-of-the-art Integrated Flood Warning System
- Subhash Chandra Bose Aapda Prabandhan Puraskar- Award for Disaster Management
- Gujarat Institute of Disaster Management (in the Institutional category) and Professor Vinod Sharma (in the Individual category)
- Civil defence volunteer- A cadet for Community Response

| | | |
|---|---|---|
| **21** | **DRR- Sendai Framework** | |
| | **Why is Sendai Framework different?**<br>– For the first time the goals → outcome-based targets<br>– Governments at the Centre of DRR<br>– Shift from disaster management to addressing disaster risk management<br>– Equal importance on all kinds of disasters (not only natural hazards).<br>– In addition to social vulnerability→considerable attention to environmental aspects<br>– Disaster risk reduction to be seen as a policy concern that cuts across many sectors, including health and education<br>  <br>**Issues:**<br>– Funding Commitment is lacking at Global Levels<br>– No clear definition of gender is offered: Fails to understand the intersectionality of Gender and Women in Disaster Management<br>– Monitoring compliance with the Sendai Framework<br>– District level measures for Safe Building Practices is lacking<br>– Poor co-ordination at the local level, lack of early-warning systems,<br>– paucity of trained dedicated clinicians, lack of search and rescue facilities and poor community empowerment | |
| **22** | **Vulnerability profile of India** | |
| | For Data on the Risk Profile of India refer this figure:<br>According to the different types of losses, the vulnerability can be defined as;<br>– **Physical Vulnerability**: meaning the potential for physical impact on the physical environment<br>– **Economic vulnerability**: the potential impacts of hazards on economic assets and processes (i.e., business interruption, secondary effects such as increased poverty and job loss) | |

| | | |
|---|---|---|
| | – **Social vulnerability**: the potential impacts of events on groups such as the poor, single parent households, pregnant or lactating women, the handicapped, children, and elderly;<br>– **Environmental vulnerability**: the potential impacts of events on the environment (flora, fauna, ecosystems, biodiversity).<br>– **Attitudinal Vulnerability**: A community which has negative attitude towards change and lacks initiative in life resultantly become more and more dependent on external support. | |
| **23** | **Kerala floods** | |
| | **Causes**<br>– Unplanned development: Encroachment, failure of flood control structures, unplanned reservoirs,<br>– Natural causes: Climate change aggravating flood problems, degradation of river catchment and heavy siltation.<br>– Rapid urbanization: Indiscriminate settlements on water bodies and wetlands leading to inadequate capacity of drains.<br>– Lack of pre-disaster planning: Largely neglected<br>– Failure in compliance to expert recommendation: Gadgil Committee's suggestion on declaring certain area as environmentally sensitive zones were ignored.<br><br>**Threat of flooding**<br>– Loss of life and property<br>– Inundation of agricultural land → loss of crops → threat to food security<br>– Social issues: People rendered homeless | |



| | | |
|---|---|---|
| | – Health issues: Spread of diseases like cholera, hepatitis and other water-borne diseases.<br>– Stress on budget: Flood relief fund and need to rebuild.<br><br>**Links with climate change**<br>– Change in climatic patterns like rainfall due to monsoon which is dependent on several factors like ENSO, Indian Ocean Dipole etc<br>– Erratic rainfall making it hard to predict and be prepared.<br>– Melting of glaciers → Increased flow in rivers<br>– Disappearance of lakes due to climate change leading to unregulated flow of rivers at times.<br>– Traditional weather prediction equipment is getting irrelevant with unknown factors of climate change playing a part →<br><br>**Way ahead**<br>– Improving forecasting techniques<br>– Developing a comprehensive flood management plan<br>– Complying with Disaster Risk Reduction guidelines on prevention, preparedness and mitigation. | |
| **24** | **Flood plain zoning** | |
| | **Concept**<br>– An effective non-structural flood management measure where land in flood plains is regulated in order to restrict damage caused by floods.<br><br>**National Floodplains Zoning Policy**<br>– Flood Plain Zoning was recognized as an effective non-structural measure for flood management under the guidelines issued by NDMA.<br>– Flood prone areas are being mapped under the policy across different states: Almost 50 million hectares is flood prone in the country.<br>– Jal Shakti Ministry has been telling the States the need to adopt the approach.<br>– Features:<br>• Determining the developmental activities – to build database<br>• Imposing restrictions – on both protected and unprotected areas. Prevents indiscriminate and unscientific growth in unprotected areas. Only activities which won't cause heavy damage will be permitted.<br>• Uses: Besides occasional floods, it also helps in decreasing damage caused by drainage congestion, especially in urban ares.<br>– NMCG(Clean Ganga) is also aligned to the policy.<br>**Recent developments** | |

| | | |
|---|---|---|
| | – Though many states have enacted the policy, they are yet to undertake delineation and demarcation of flood plains.<br>– Model Bill for Flood Plain Zoning: Provides provisions for flood zoning authorities, surveys and delineation of flood plain area, notification of limits of flood plains, prohibition of the use of the flood plains, compensation etc.<br>NMCG has advised all states in Ganga basin for demarcation, delineation and notification of river flood plains. | |
| **25** | **Global Platform for Disaster Resilient Infrastructure (CDRI)** | |
| | **Relevance**<br>– From risk to resilience: Towards sustainable development for all in a world transformed by the pandemic.<br>– **Disaster resilient Infrastructure**: Infrastructure that can stand any huge damage from any kind of natural disaster is known as Disaster Resilient Infrastructure<br>• Structural measures involve adjusting engineering designs and standards to reflect disaster risk such as flood control systems, protective embankments, seawall rehabilitation, and retrofitting of buildings.<br>• Non-structural measures refer to risk-sensitive planning, enabling institutional frameworks, hazard mapping, ecosystem-based management, and disaster risk financing.<br><br>**Outcomes of GPDRR 2022(summarised in Bali Agenda for Resilience)**<br>– Need for a "whole-of-society" approach to ensure no one is left behind.<br>– DRR as the core of development and finance policies and legislations to achieve 2030 SDGs<br>– Recognition of GHG levels leading to increased frequency of catastrophic events → So DRR and climate change adaptation have common objectives of reducing vulnerability and enhancing resilience.<br>– GPDRI 2022's suggestions<br>• Greater resource allocation for grounded local action<br>• More focus on building resilience and sustainable livelihoods focusing on community level.<br>• Greater accountability and transparency in relief and rehabilitation efforts.<br>**Other initiatives:**<br>– Sendai Framework: Stressed<br>– Climate Risk and Early Warning Systems(CREWS)<br>– Coalition for Disaster Resilient Infrastructure Society (CDRIS).<br>• Disaster Risk Assessment | |

| | | |
|---|---|---|
| | • Standards of design and implementation<br>• Financing new infra and mechanisms to cover risks<br>• Reconstruction and recovery of infra after disasters | |
| **26** | **Coalition for Disaster Resilient Infrastructure (CDRI)** | |
| | CRDI is a global partnership that aims to promote the resilience of new and existing infrastructure systems to climate and disaster risks in support of sustainable development.<br><br>**Objective:**<br><br>promote research and knowledge sharing in the fields of infrastructure risk management, standards, financing, and recovery mechanisms.<br><br>**Significance:**<br><br>• India's second major global initiative after the ISA and it demonstrates India's leadership in climate change and disaster resilience issues.<br>• to obtain a global leadership role in climate change matters and were termed as part of India's stronger branding.<br>• Can provide a safer alternative to China's Belt and Road Initiative (BRI).<br><br>**Strategic priorities:**<br><br>• Technical Support and Capacity-building: This includes disaster response and recovery support; innovation, institutional and community capacity-building assistance; and standards and certification.<br>• Research and Knowledge Management: This includes collaborative research; global flagship reports; and a global database of infrastructure and sector resilience.<br>• Advocacy and Partnerships: This includes global events and initiatives; marketplace of knowledge financing and implementation agencies; and dissemination of knowledge products. | |
| **27** | **Disaster Management Plan of Ministry of Panchayati Raj** | |
| | – India is the 7th most disaster-prone country in the world according to the "Global Climate Risk Index 2021"<br>**Need for such a Plan**<br>• India has been vulnerable due to its unique geo-climatic and socio-economic conditions.<br>• SOPs are virtually non-existent and inefficient<br>• inadequate coordination among various government departments and other stakeholders. | |

| | | |
|---|---|---|
| | ● Poor warning and relief system<br><br>**Components:**<br>● It covers areas such as:<br>○ Institutional arrangement for Disaster Management;<br>○ Hazard Risk, Vulnerability and Capacity Analysis; Coherence of Disaster Risk Management across Resilient Development and Climate Change Action;<br>○ Disaster Specific Preventive and Mitigation Measures-Responsibility Framework;<br>○ Mainstreaming of Community Based Disaster Management Plan of Villages and Panchayats<br>**Significance**<br>● Panchayat-level and village-level Disaster Management Plans→ to mitigate the challenges in the event of disaster from a foundational level.<br>● make people more prepared for countering natural disasters<br>● Promotes Social mobilization<br>● tap the traditional wisdom of the local communities in disaster mitigation efforts.<br>● Provides base for integration of various concerns of the community<br>● PRI members can play a role of leadership in Disaster management at all stages. | |
| **28** | **Coastal Vulnerability Index** | |
| | INCOIS has carried out a coastal vulnerability assessment for the entire Indian coast at States level.<br><br>Coastal vulnerability is a spatial concept that identifies people and places that are susceptible to disturbances resulting from coastal hazards.<br><br>The CVI uses the relative risk that physical changes will occur as sea-level rises are quantified based on parameters like:<br>● Tidal range<br>● Wave height<br>● Coastal slope<br>● Coastal elevation<br>● Shoreline change rate<br>● Geomorphology<br>● Historical rate of relative sea-level change.<br><br>**Importance**<br>● India has a coastline of 7516.6 Km i.e. 6100 km of mainland coastline plus coastline of 1197 Indian islands touching 13 States and Union Territories | |

- can provide valuable information for disaster preparedness and the development of resilient coastal communities.
- can help avert loss of life and property as well as help city planners develop coastal hazard resilient designs.

**Coastal security**

Coastal security has a wide connotation encompassing maritime border management, island security, maintenance of peace, stability and good order in coastal areas and enforcement of laws

**Why is it necessary?**

- National Security
- Economic development:
  - Trade: 95% of India's trade by volume and 68% of trade by value comes via the Indian Ocean.
  - Fish production: India -second-largest fish producer in the world
  - Strategic minerals - The beach and dune sands in India contain heavy minerals (HMs) like ilmenite, rutile, garnet, zircon, monazite and sillimanite
- Geostrategic interests: IOR has become a pivotal zone of global strategic competition.
- Dealing with climate-induced crises
  the sinking of islands due to the rising sea levels → rise of climate refugees.



## 29 CYCLONE MANAGEMENT IN INDIA

Cyclone Disaster Management encompasses mitigation and preparedness measures for cyclones
The storms caused by wind blowing around the low-pressure areas are called cyclones.

**Cyclones in India**

India witnesses cyclones in the North Indian Ocean Cyclone Season usually between April and November. The Indian coastline length is around 7516 km and it is noted that 5770 km of coastline is vulnerable to natural hazards including cyclones. The east coast of India is more prone to cyclones than the western coast.

**Cyclone Disaster Management**

- Mitigation Measures →Hazard Mapping →Land use planning → Engineered Structures – These structures withstand the wind forces and prove to mitigate the losses.

| | | |
|---|---|---|
| | – **Retrofitting Non-Engineered Structures** – The settlements in non-engineered structures should ensure that they are aware of their houses' resistance to the wind or certain disastrous weather conditions<br>– **Cyclone Sheltering** – At national, state and regional level, the construction of cyclone shelters should be taken up to help the vulnerable community from cyclones.<br><br>**Flood Management**<br><br>– **Vegetation Cover Improvement** – To increase the water infiltration capacity, improving vegetation cover is of high importance.<br>– **Mangrove Plantation**<br>– **Saline Embankment**<br>– **Levees** – They act as an obstruction to the wind forces and also provide a shelter during floods.<br>– **Artificial Hills** – These act as the refuge during flooding, and should be taken up in the right areas.<br>– **Awareness of the public**<br><br>**India's Cyclone Disaster Management Initiatives**<br>– National Cyclone Risk Mitigation Project<br>– India initiated this project to undertake structural and non-structural measures to mitigate the cyclone's effects.<br>– Integrated Coastal Zone Management (ICZM) Project<br>o It aims to bring a comprehensive plan to manage coastal areas<br>– Coastal Regulation Zones (CRZ)<br>– IMD's Colour Coding of Cyclones<br>– It is a weather warning that is issued by the IMD to aware people ahead of natural hazards. | |
| **30** | **ROLE OF NGO AND COMMUNITY ORGANISATION IN DISASTER MANAGEMENT** | |
| | **Disaster management** is the managerial function charged with creating the framework within which communities reduce vulnerability to hazards and cope with disasters<br><br>**Disaster Preparedness**<br>– Advocacy/ awareness→Assessment/ Analysis→Capacity building<br>Co-ordination and partnership→Miscellaneous like shelter, water availability, sanitation, conservation, mock drills, etc.<br>**Disaster Response**<br>– Early warning and evacuation →Search and Rescue →Emergency Relief and Humanitarian Assistance→Civil Military Coordination | |

- Primary Damage and Needs Assessment

**Recovery phase**

- Water/Sanitation/Pulic health promotion/Vector control/Food security and nutrition/Shelter

**Reconstruction**

**Disaster Mitigation**

- Participatory & Inclusive Approach in mitigation
- Mitigation planning (Assessment, Identification, Analysis of Risk and Planning)
- Information Dissemination
- Techno-Legal and Techno-Financial regime

**POSITIVES**

- Initial response and as first responders


- Ability to experiment freely with innovative approaches and, if necessary, to take risks.
- Ability to recruit both experts and highly motivated staff with fewer restrictions than the government
- Ability of international NGOs to provide specialized emergency medical care
- Ability to gather funds from international societies / communities
- Ability of local NGOs to communicate without language barriers

Their knowledge of the local area and community

**NEGATIVES**

- Political pressure
- Lack of proper Funds from governments and their proper utilization
- Harassment of victims by un-sensitized volunteers
- Paternalistic attitudes restrict the degree of participation in programme/project design.
- Territorial possessiveness/ competitiveness
- Lack of Dedicated Leadership
- After-response phase wastages

**CHALLENGES**

| | | |
|---|---|---|
| | – Co-ordination/Proper Finance channeling/Grass-root level of Participation in Planning/Encouraging communities and individuals to be Active participants/Building of disaster resilient cities/towns/villages/External collaboration<br>**RECOMMENDATIONS**<br>– Specific Code of conduct for NGOs<br>– Quality of service<br>– Popularize volunteerism<br>– Mandatory training of NGO members<br>– Establishment of coordinating agencies<br>– Mock drills<br>– Revision of allowances and funds for NGOs<br>**Modernized equipment's and technological support** | |