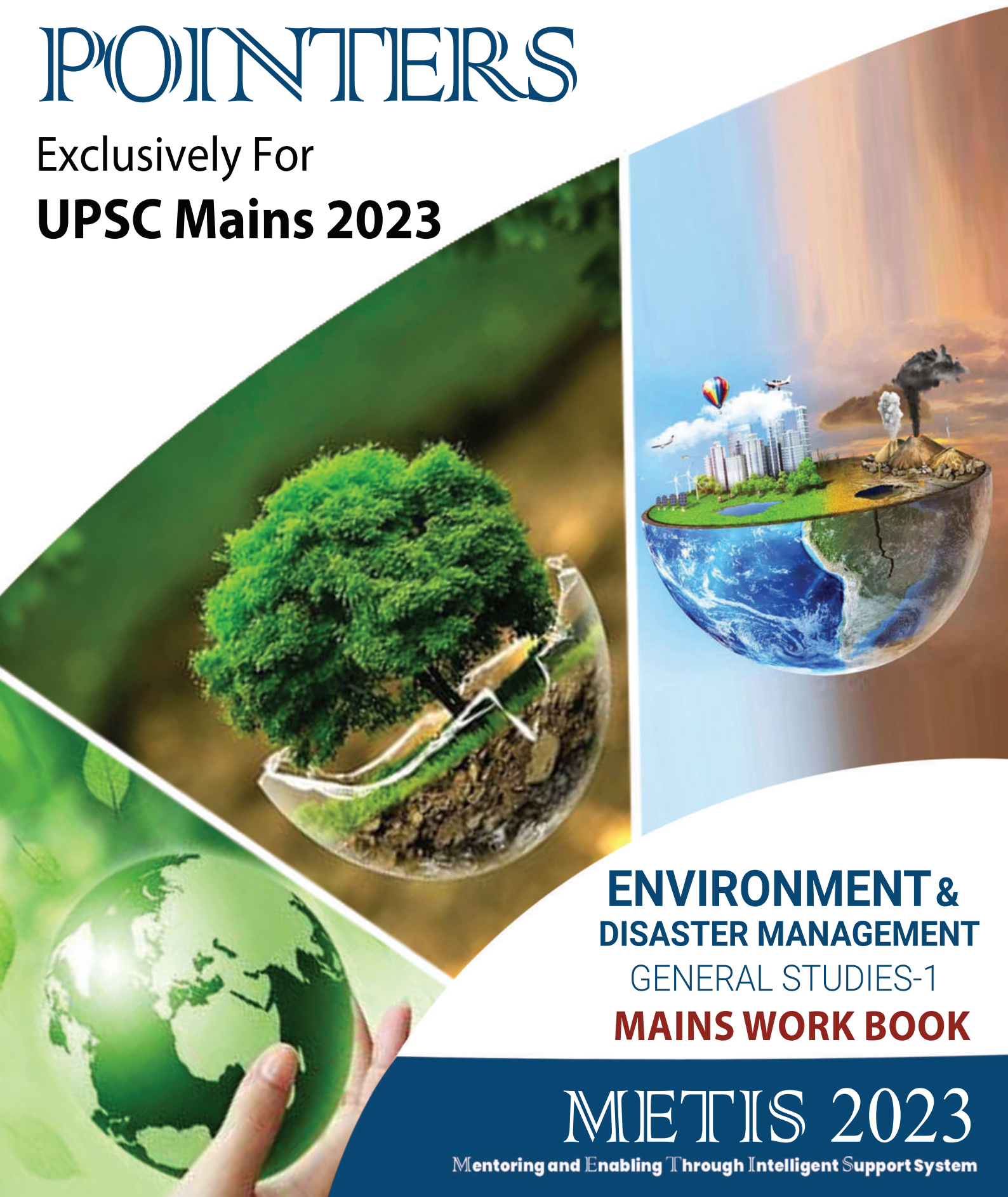
SIVARAJAVEL IAS ACADEMY
AN IDEAL INSTITUTE FOR CIVIL SERVICE EXAMS

TOPICS & POINTERS

Exclusively For
UPSC Mains 2023



ENVIRONMENT & DISASTER MANAGEMENT

GENERAL STUDIES-1

MAINS WORK BOOK

METIS 2023

Mentoring and Enabling Through Intelligent Support System

TOPICS AND POINTERS

2023- MAINS STUDY MODULE

Previous Year Questions on Biodiversity & Environment	
2022	1. Each year a large amount of plant material, cellulose is deposited on the surface of Planet Earth. What are the natural processes this cellulose undergoes before yielding carbon dioxide, water and other end products? 2. Discuss in detail the photochemical smog emphasizing its formation, effects and mitigation. Explain the 1999 Gothenburg Protocol. 3. Discuss global warming and mention its effects on the global climate. Explain the control measures to bring down the level of greenhouse gases which cause global warming, in light of the Kyoto Protocol, 1997. 4. Explain the causes and effects of coastal erosion in India. What are the available coastal management techniques for combating the hazard?
2021	5. 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)? 6. 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? 7. 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? 2. What are the salient features of the Jal Shakti Abhiyan launched by the Government of India for water conservation and water security? 3. Suggest measures to improve water storage and irrigation system to make its judicious use under the depleting scenario. 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? 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. 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? 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. 3. Sikkim is the first 'Organic State' in India. What are the ecological and economical benefits of an Organic State?

	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. 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?
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). 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. 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. 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. 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

2023- MAINS STUDY MODULE

Previous Year Questions on Disaster Management	
2022	1. Explain the mechanism and occurrence of cloudbursts in the context of the Indian subcontinent. Discuss two recent examples.
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. 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? 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.	**27TH CONFERENCE OF THE PARTIES to UNFCCC**	

- held at Sharm El-Sheikh, Egypt
- Significance - aims to build on previous successes, including the Glasgow Climate Pact of COP26 and pave the way for higher ambition on mitigation, adaptation and climate finance, with focus on loss and damage.
- The conference concluded with release of Sharm el-Sheikh Implementation Plan.

Key outcomes of the COP27

- Countries requested to revisit and strengthen their 2030 climate targets by the end of 2023, as necessary to align with the Paris Agreement
- Finalised the details of Mitigation work programme to urgently scale up mitigation ambition and implementation in this decade.
- Development of a framework for the global goal on adaptation to be undertaken through a structured approach under the Glasgow–Sharm el-Sheikh work programme in 2023 at COP28.
- New pledges, totaling more than USD 230 million, were made to the Adaptation Fund.
- Sharm el-Sheikh dialogue launched on Article 2.1c of the Paris Agreement, which says "financial flows" should be aligned with global temperature targets.
- **Loss and Damage** - New funding arrangements established for assisting developing countries that are particularly vulnerable to the adverse effects of climate change, in responding to loss and damage - A transitional committee set up to make recommendations for the operationalization of the new funding arrangements at COP28 - Institutional arrangements made for operationalization of the Santiago network. The host of the secretariat of the network will be selected by 2023.
- **Agriculture** - Koronivia Joint Work for Agriculture (KJWA) given another four-year lease by establishment of the four-year Sharm el-Sheikh joint work on implementation of climate action on agriculture and food security - KJWA is a landmark decision under UNFCCC that recognizes unique potential of agriculture in tackling climate change - It addresses six interrelated topics on soils, nutrient use, water, livestock, methods for assessing adaptation, and

socio-economic and food security dimensions of climate change across agricultural sectors.

Major issues

- No commitments to phase out all fossil fuels.
- Lack of stringent mitigation targets such as global emissions to peak as soon as possible and by 2025.
- Finance related issues: Inadequate climate finance; Unequal access of climate finance for Developing nations; Unclear definition of "climate finance"; shortage of Grants-based finance; global climate finances skewed towards mitigation activities etc.
- Full rules of procedure for Article 6.2, relating to Market Mechanism for carbon trading, remain unresolved.
- Prevalence of Greenwashing (the practice of misleading general
- public into believing that companies, sovereigns or civic administrators are doing more for the environment than they actually are).
- Concerns related to Fossil fuel lobbying.
- NDCs for 2030 remain totally inadequate to fulfil the 1.5° pathway.

Recommendations

- Enhancing mitigation targets through rapid, deep and sustained reductions in global GHG of 43% by 2030 relative to the 2019 level.
- Gradual phase out of all fossil fuels.
- Scaling climate finance through contribution from developed nations, proactive involvement of private sector, multilateral finance institutions.
- Promote Just Energy Transition Partnerships (JETPs) to finance the energy transitions of emerging economies.
- Establishing clear source and commitments for funding loss and damage through dialogue.
- Adopting clear definitions for climate finance reflecting the principle of common but differentiated responsibilities (CBDR).
- Setting standards to quantify and measure emission reductions to reduce instances of greenwashing.

2.	India and Net Zero Emissions	

What is Net Zero?

- Referred as carbon neutrality - a country would bring down its emissions to zero - a state in which a country's emissions are compensated by the absorption and removal of greenhouse gases from the atmosphere
- More than 70 countries have promised to become Net Zero by the middle of the century i.e., by 2050.
- India has promised to cut its emissions to net zero by 2070 at the conference of parties-26(COP) summit.

India's updated climate commitments

INDIA'S NATIONALLY DETERMINED CONTRIBUTION (NDC)

Quantitative Targets

	Targets for 2030	Previous NDC, 2015	Updated NDC, 2022	Progress
1	**Reduce the emissions intensity of its GDP**	By **33 to 35% by 2030** from 2005 level.	By **45% by 2030** from 2005 level.	Estimated **reduction of 21%** over 2005 levels (The Green Shift Report by MOP&NG)
2	**Cumulative electric power installed capacity from non-fossil fuel-based energy resources** with the help of transfer of technology and low-cost international finance including from Green Climate Fund (GCF).	About **40%**	About **50%**	**43% achieved.** (April 2023, Ministry of Power)
3	**Create an additional carbon sink** through additional forest and tree cover	**2.5 to 3 billion tonnes of Co2 equivalent**	**Same as earlier**	**Current rate of 1.9-2.0 GtCO2 in additional carbon sink by 2030**

Qualitative Targets

	Previous NDC, 2015	Updated NDC, 2022
4	Put forward and further propagate a **healthy and sustainable way of living** based on traditions and values of conservation and moderation.	Put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation, including through a mass movement for **'LIFE'- 'Lifestyle for Environment'** as a key to combating climate change.
5	**Adopt a climate friendly and a cleaner path** than the one followed hitherto by others at corresponding level of economic development.	**Same as earlier**
6	**Better adapt to climate change** by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.	**Same as earlier**
7	**Mobilize domestic and new & additional funds** from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap.	**Same as earlier**
8	**Build capacities, create domestic framework and international architecture** for quick diffusion of cutting edge climate technology in India and for joint collaborative R&D for such future technologies.	**Same as earlier**

Recently, India submitted its Long-Term Low Emission Development Strategy to the United Nations Framework

Convention on Climate Change (UNFCCC) at ongoing 27th Conference of Parties (COP27) in Sharm el-Sheikh, Egypt.

What is a Long-Term Low Emissions Development Strategy?

- The LT-LEDS are qualitative in nature and are a requirement emanating from the 2015 Paris Agreement.
- Under the Paris agreement, countries must explain how they will transition their economies beyond achieving near-term Nationally Determined Contributions (NDCs) targets and work towards the larger climate objective of cutting emissions by 45% by 2030 and achieve net zero around 2050.
- The LT-LEDS is also informed by the vision of LiFE, Lifestyle for the Environment - LiFE calls for a world-wide paradigm shift from mindless and destructive consumption to mindful and deliberate utilization.

Features of the LT-LEDS

- Focus on rational utilization of national resources with due regard to energy security - transitions from fossil fuels will be undertaken in a just, smooth, sustainable and all-inclusive manner.
- Promote increased use of biofuels, especially ethanol blending in petrol, the drive to increase electric vehicle penetration, and the increased use of green hydrogen fuel are expected to drive the low carbon development of the transport sector.
- Aspires to maximize the use of electric vehicles, ethanol blending to reach 20% by 2025, and a strong modal shift to public transport for passenger and freight.
- Low-base, future sustainable, and climate-resilient urban development will be driven by smart city initiatives, integrated planning of cities for mainstreaming adaptation and enhancing energy and resource efficiency, effective green building codes and rapid developments in innovative solid and liquid waste management.
- Focus on improving energy efficiency by the Perform, Achieve and Trade (PAT) scheme, the National Hydrogen Mission, increasing electrification, enhancing material efficiency, and recycling and ways to reduce emissions.

Steps have been taken by India to achieve net- zero emissions by 2070

- India's renewable energy targets have steadily become more ambitious, from 175 GW by 2022 declared at Paris,

to 450 GW by 2030 at the UN Climate Summit, and now 500 GW by 2030, announced at COP26.

- Also announced the target of 50% installed power generation capacity from non-fossil energy sources by 2030, raising the existing target of 40%, which has already been almost achieved.
- India has undertaken one of the world's largest solar energy installation initiative, irrespective of whether it achieves the 175 GW capacity by 2022 or the 450 GW target by 2030
- India Cooling Action Plan (ICAP) will help address cooling requirements and reduce the cooling demand in the country.
- The Bureau of Energy Efficiency (BEE) and Energy Efficiency Services Limited (EESL) has taken a number of initiatives under the National Mission for Enhanced Energy Efficiency (NMEEE) to combat climate change.
- The Compensatory Afforestation Management and Planning Authority (CAMPA) Fund created under the Compensatory Afforestation Fund Act, 2016, has thousands of crores which will hopefully be utilised soon to compensate for deforestation and restore the green cover comprising native species of trees.

Challenges in achieving climate targets

- Pace of decommissioning coal-based plants does not match the pace of rise of renewable energy.
- Constraints in increasing share of renewable energy – Intermittent supply, high dependence on import for components, high cost of storage, grid connectivity etc.
- Dilution of panchamrita commitments in NDCs.
- Financial constraints (climate finance of $1 trillion needed by
- developed countries).
- Lack of sector specific mitigation obligation or action.
- Issues in implementation of the climate missions like inter-ministerial coordination; lack of technical expertise and project clearance delays etc.

Way Forward

- Provision of new and additional financial resources as well as
- transfer of technology by developed countries under UNFCCC and the Paris Agreement.

	– Gradually phasing out coal by early retirement of the existing coal capacity and reduction of the coal project pipeline. – Developing a mitigation strategy for net zero goals. – Need of net negative emission commitments from developed nations to vacate the carbon space in 2050 for developing countries. – Focusing on energy intensive sectors for emission reduction.	
3.	**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: o Design out waste & pollution o Keep products & materials in use o 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. • Invisible hand of market forces will conspire to create full displacement of virgin material of the same kind. **Conclusion** • Urgent need for gradually decoupling economic activity from the consumption of finite resources & designing waste out of the system. • Underpinned by a transition to renewable energy sources -> the circular model builds economic, natural & social capital. • Resource circularity is the need of the hour to implement the circular economy.	
4.	**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.

- 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.

How climate change causes migration?

- Intensification of natural disasters.
- Increased warming & drought -> affects agricultural production & access to clean water.
- 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).
- Competition over natural resources -> lead to conflict & in turn migration.

Scale of climate-induced migration

- World Economic Forum finds => Between 2008 and 2016 -> extreme weather events forced over 20 million people each year to become climate refugees.
- World Bank estimates => By 2050, 1.2 billion people could become environmental refugees (40 million in South Asia alone).
- India -> very vulnerable to climate-induced migration -> ranks 7th in Global Climate Risks Index, 2021.
- In 2018, environmental disasters caused over 2.7 million displacements.
- 45 million, in India alone -> will be forced to migrate from their homes due to climate disasters by 2050.

Issues/Challenges

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.	
5.	**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. • There are both ecological & economical interactions between different components. • Agroforestry is currently practised on 13.5 million hectares in India, but its potential is far greater. • Already an estimated 65 % of the country's timber and almost half of its fuel wood come from trees grown on farms. • 3 main types of agroforestry systems: i. Agri-silvicultural systems => combination of crops/trees -> such as alley cropping or home gardens. ii. Silvopastoral systems => combine forestry & grazing of domesticated animals on pastures, rangelands or on-farm. iii. Agro-silvopastoral systems => 3 elements -> trees, animals & crops can be integrated. **Benefits of AgroForestry** • Agroforestry is crucial to smallholder farmers & other rural people -> because it can enhance their food supply, income & health. • They are multifunctional systems -> provide wide range of economic, sociocultural & environmental benefits. • Produces food/fuel/fibre, contributes to nutritional security, sustains livelihoods, helps prevent deforestation, increases biodiversity, protects water resources & reduces erosion. • Means to reduce rural unemployment, with timber production on farms currently generating 450 employment days/hectare/year in India.	

	• Climate change mitigation/adaptation benefits of agroforestry. **Adverse effects** • Market-oriented trees are preferred which damage the ecosystem. Instead of Poplar & eucalyptus -> farmers should plant neem, Mahua, Arjun & Acacia. • Fuelwood and fodder trees are generally neglected. • Exotic varieties are soil-moisture & water exhaustive -> resulting in adversely affecting groundwater table. • 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. • In the field where the trees are planted the productivity per unit area decreases. **Way forward** • Sector needs to be institutionally bolstered and profiled from the perspective of its utility spectrum that knits farm-forestry, environmental protection, and sustainable development. • Financial support should be provided to all small landholders, rather than only Scheduled Caste and Scheduled Tribe farmers. • 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. • Amending unfavourable legislation and simplifying regulations related to forestry and agriculture. • 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.	
6.	**Cheetah Reintroduction Programme**	
	– In modern times, human impacts are primarily responsible for species extinctions and biodiversity loss - In India's context, cheetah, the only large carnivore made extinct in independent India by human actions	

- Reintroduced by Indian government in September 2022, reinforcing the government's commitment to conserving our natural heritage.

Cheetah is flagship and umbrella species of the ecosystem

- The cheetah served as an evolutionary force and was responsible for the fast speed of the blackbuck, its major prey.
- Unlike tigers, leopards and lions — ambush predators — the cheetah hunts by chasing its prey and thereby removes the sick, old, as well as young from the population, ensuring the survival of the fittest and keeping the prey population healthy.
- A top carnivore at the apex of the food chain can sustain its population when lower trophic levels are functioning optimally.
- This is the philosophy of Project Tiger, which uses the tiger as a flagship to garner resources for conserving intact ecosystems. Several ecosystems in India do not have tigers; cheetahs could serve as a flagship for conservation there.

Successful reintroductions require long-term commitments

- Re-wilding ecosystems requires a reduction in biotic pressures by incentivized voluntary relocation of communities, as has been done in tiger reserves. Resources required for these need to be committed to a minimum of three to five sites for the long term (25-30 years).
- As, India does not have Africa's vast wilderness with low human densities. However, within the historic range of the cheetah, India approximately one lakh square km under protected areas (PAs). However, Individual PAs by themselves are not big enough to sustain a viable cheetah population in the long term.
- Therefore, conservation practitioners need to be innovative and manage cheetahs from these sites as a metapopulation artificially moving animals between them to mimic natural dispersal for demographic and genetic viability.
- Once cheetahs build up a population, they will disperse naturally to colonise larger human-dominated landscapes and may potentially exchange individuals between some of the conservation sites naturally.

Conservation effort of biodiversity provides incentives for local communities

- As, conservation efforts lead to relocation of forest dwelling communities, incentives are given to local communities by government to relocate them.
- It is a win-win situation for the local people and biodiversity conservation, and an opportunity for governments to earn peoples' goodwill.
- Given an opportunity, most forest communities prefer to join mainstream society that gives them access to markets, roads, electricity, hospitals, jobs, and education.
- Community-based ecotourism, sharing of gate receipts with buffer zone villages, and an increase in real estate with the arrival of biodiversity are some direct economic benefits to local people if schemes are implemented prudently and equitably
- Along with, A scheme to compensate for livestock predation that is transparent needs to be implemented.
- If people benefit economically from having cheetahs in their neighbourhood like people in Saurashtra benefit from lions, they are likely to be more tolerant towards the animals.

Challenges related to introduction of Chettah in Kuno National Park

- As Southern Africa, from where the cheetahs have been brought, currently has a cold dry winter in response the animals developed a winter coat. Therefore, their physiological cycle is still tuned to the photoperiod of Southern latitudes.
- In Kuno, they experienced a hot and humid climate — their winter fur accumulated moisture and the radio collars aggravated the condition making their skin itchy and delicate. Scratching resulted in wounds that were infected by maggots.
- Unfortunately, the inexperience of the field staff did not allow detection of the infection in time which could have led to an easy cure.
- Given time, the Southern African cheetahs are likely to adapt to the Indian photoperiod and change their biorhythms to time their coat with Indian winters.

	Conclusion – The release of the first inter-continentally translocated cheetahs, gave the project the required prestige. Metapopulation management along with economic benefits to communities is the only way to reestablish Cheetahs in India. – The reintroduction project is much required for the ecological security of India. Therefore, threatened species of the savanna and deciduous forests — wolves, caracal, blackbuck, bustards, four-horned antelopes and chinkara — would benefit from the investments in bringing back the cheetah.	
7.	**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, – followed by recycling the CO2 for utilization and determining safe and permanent storage options. – Various approaches have been conceived for permanent storage – 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. – 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. **Applications of CCUS:** – Carbon neutral fuel→playing a crucial role in climate change mitigation – Combining Co2 with steel slag to make construction materials compatible with Paris goals (would be more beneficial with respect to Indian real estate sector) – Enhanced oil and gas recovery – 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.	

	Challenges: – Carbon capture involves the development of sorbents which is expensive. – new infrastructure costs and unreliable policy decisions poses a bigger challenge in effective implementation of CCUS.	
8.	**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. Climate-smart agricultural systems include different elements such as: • 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; • ecosystem and landscape management to conserve ecosystem services that are important for food security, agricultural development, adaptation and mitigation; • 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 • changes in the wider food system including demand-side measures and value chain interventions that enhance the benefits of climate-smart agriculture. **Significance:** • sustainably increase agricultural productivity and incomes; • adapt and build resilience to climate change • reduce and/or remove greenhouse gas emissions, where possible. 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. **Way forward** 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.	

9.	**Reforming the fertilizer sector**	

Since 1991 economic reforms, several attempts were made to reform the fertilizer sector to keep a check on the rising fertilizer subsidy bill, promote the efficient use of fertilizers, achieve balanced use of N, P and K (nitrogen, phosphorus and potassium), and reduce water and air pollution caused by fertilizers like urea.

History of Increase in subsidy

- 1991 - prices of fertilizers were raised by 30% on average. The Economic Survey of 1991-92 noted that fertilizer prices remained almost unchanged from July 1981 to July 1991 and even with this 30% increase, fertilizer subsidy remained substantial and needed to be reduced further.
- Due to opposition to increase fertilizer prices, the increase in the price of urea was rolled back to 17% a year later over the pre-reform price.

This created various challenges

- Wrong composition of fertilizer being used - high Urea subsidy has resulted in a big shift in the composition of fertilizers used in the country in favour of urea (N). The ratio of use of N:P:K increased from 5.9:2.4:1 in 1991-92 to 9.7:2.9:1 in 1993-94 as P & K are significantly costlier. Whereas the Ideal ratio is 4:2:1.
- Incentivizing incorrect proportion - Farmers tended to move towards balanced use, but policy and price changes reversed the favourable trend a couple of times in the last three decades.
- Uncontrolled increase in Urea subsidies: Over time, due to - 1) almost freezing the MRP of urea in different time periods and 2) its rising sale leading to an increase in indiscriminate and imbalanced use of fertilizers.
- Current Cost of Fertilizer subsidy - doubled in a short period of three years. For 2021-22, the Union Budget has estimated fertilizer subsidy at ₹79,530 crore (from ₹66,468 crore in 2017-18) but it is likely to reach a much higher level due to the recent upsurge in the prices of energy, the international prices of urea and other fertilizers, and India's dependence on imports.
- Regional Disparities - In 2019-20, fertilizer use per hectare of cultivated area varied from 70 kg of NPK in Rajasthan to 250 kg in Telangana. This gap was much wider at the district level. Further, N,P,K ratio deviated considerably

from the recommended or optimal NPK mix. It was 33.7:8.0:1 in Punjab and 1.3:0.7:1 in Kerala.

- Inter-state disparities - due to high variations in subsidy content, which is highly biased towards urea and thus nitrogen. As a result, the magnitude of fertilizer subsidy among the major States ranges in the ratio of 8:1.
- Serious fiscal challenges - High prices internationally also coincides with the peak demand for the Rabi season. In order to minimise the impact of rise in prices on farmers, the bulk of the price rise is absorbed by the government through enhanced fertilizer subsidy. This is likely to create serious fiscal challenges.

Impact of International Prices

- Import dependence for P & K: The total demand for urea in the country is about 34-35 million tonnes (mln t) whereas the domestic production is about 25 mln t. The requirement of Diammonium Phosphate (DAP) is about 12 mln t and domestic production is just 5 mln t. This leaves the gap of nearly 9-10 mln t for urea and 7 mln t for DAP, which is met through imports. The use of Muriate of Potash is about 3 mln t. This is entirely imported.
- Price fluctuations in international market - The international prices of fertilizers are volatile and almost directly proportional to energy prices. Besides, cartels of major global producers have a strong influence on prices. The taxpayers bear 78% of the cost of urea and farmers pay only 22%. This is expected to increase and is not sustainable.

Possible reforms

- Demand to provide subsidies to organic fertilizers /biofertilizers - Concerned with the adverse environmental impact of certain chemical fertilizers, some sections of society suggest the use of organic fertilizers and biofertilizers instead.
- Nutrient Based Subsidy (NBS) - introduced in 2010 to address the growing imbalance in fertilizer use in many States, which is skewed towards urea (N). However, only non-nitrogenous fertilizers (P and K) moved to NBS; urea was left out.

Way forward

- In order to address the multiple goals of fertilizer policy, we need to simultaneously work on four key policy areas.

	– Self-reliance & Import substitution: In this way, we can escape the vagaries of high volatility in international prices. In this direction, five urea plants at Gorakhpur, Sindri, Barauni, Talcher and Ramagundam are being revived in the public sector. – Extend the NBS model to urea and allow for price rationalisation of urea compared to non-nitrogenous fertilizers and prices of crops. The present system of keeping the price of urea fixed and absorbing all the price increases in subsidy needs to be replaced by distribution of price change over both price as well as subsidy based on some rational formula. – Develop alternative sources of nutrition for plants: Discussions with farmers and consumers reveal a strong desire to shift towards the use of non-chemical fertilizers as well as a demand for bringing parity in prices and subsidy given to chemical fertilizers with organic and biofertilizers. This also provides the scope to use a large biomass of crop and enhance the value of livestock by products. This would require innovations. – Improving fertilizer efficiency through need-based use rather than broadcasting fertilizer in the field. The recently developed Nano urea by IFFCO shows promising results in reducing the usage of urea. Such products need to be promoted expeditiously after testing.	
10.	**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. **The policy provides as follows :** • 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. ***Lesser Margins for Producers***: The GHP omits to mention any waiver of ISTS losses for green hydrogen and ammonia projects. **Way Forward:** 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. This would further India's goal of achieving its net-zero emissions target by 2070.	
11.	**Hydropower in India: Balancing global carbon benefits with local environmental costs**	
	Hydropower in India – In 1947, hydropower capacity in India - about 37 percent of the total power generating capacity - over 53 percent of power generation. – In the late 1960s, growth in coal-based power generation initiated the decline in hydropower's share in both capacity and generation. – In 2022, hydropower capacity of 46,512 MW (megawatts) accounted for roughly 11.7 percent of total capacity. **Global benefits** • In 2020, hydropower - 4,370 Terawatt-hours (TWh) of global electricity generation - the highest contribution by a renewable and low carbon energy resource. • 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.	

- Hydropower plants can also be stopped and restarted relatively smoothly.

Local Environmental costs:

- Twelve projects of total capacity of over 3,500 MW have either been terminated or held up due to local environmental concerns.
- 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.	
12	**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. **Various models:** **Organic Farming:** – Organic fertilizers and manures like compost, vermicompost are added from external sources – Basic agri practices like tilling, ploughing required – 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.
- Awareness creation through movies and various other communication media.
- Implementation of programs upto grassroot level
- Strengthen agri market infrastructure.

13.	**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 • Balanced feeding to animals • National innovations in Climate Resilient Agriculture (NICRA) • National Mission for Sustainable Agriculture • Carbon Credit trading for farmers – initiative of IARI with private firm	
14.	**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 – 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 – 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 – **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 – 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.
- India must club its ongoing green efforts with the 'blue economy' to create a blue-green economic agenda.

Three Fundamental Pillars—climate change, health and urban resilience

Merits

- 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

Blue – Green Model initiatives

- Swachh Bharat Mission
- Smart Cities Mission
- Climate Smart Cities Assessment Framework
- Atal Mission for Rejuvenation and Urban Transformation
- Pradhan Mantri Awas Yojana – usage of renewable resources or alternative material (fly ash etc) in the construction material
- 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.
- 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.

	Way Forward → – New but rapidly adopted across the world – Need to adopt swiftly—integrated comprehensive approach needed rather than scattered approach	
15.	**National Mission on Biodiversity and Human Well-Being (NMBHWB)**	
	Need for such a mission : • Lost 7% intact forests since 2000,(Globally) • A million species might be lost forever during the next several decades. • Climate change • Global warming and Globalization • Framing of governmental policies at the biodiversity level ("one health ") **Key features of National Mission on Biodiversity and Human Well-Being (NMBHWB)** • The Mission will strengthen the science of restoring, conserving, and sustainably utilising India's natural heritage –**Sustainable Utilization** • 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** • It will establish a citizen and policy-oriented biodiversity **information system** • **Commitment to international commitments :** o Realisation of India's national biodiversity targets, o UN Sustainable Development Goals (SDGs) o commitments under the new framework for the Convention on Biological Diversity (CBD) • **Leadership role**: The Mission will allow India to emerge as a leader in demonstrating linkage between conservation of natural assets and societal well-being. • 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. • 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.	
16.	**Environment Tax**	
	Environment Tax & Benefits **Need of Environmental tax :** o To curb or reduce the extent and amount of the use or consumption of harmful substances or activities, or depletion of a resource. o Environment is also a public good which can be subjected to tax **Environmental tax and its complementary effects :** o Eliminating existing subsidies and taxes that have a harmful impact on the environment. o Restructuring existing taxes in an environmentally supportive manner. o Initiating new environmental taxes. **Intended Benefits:** o **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. o **Fiscal:** Environmental tax reforms can mobilise revenues to finance basic public services when raising revenue through other sources proves to be difficult or burdensome. **Status of Environmental Tax in India** o 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. o **a Compensatory Afforestation Fund (CAF)** should be created to manage the funds generated. o India's Clean Environment Cess or coal cess acts as **a carbon tax.** o **The coal cess** is levied on coal, lignite and peat . **Challenges in Environmental Tax :** o **Inflationary Effect:** Environmental regulations may have significant costs on the private sector in the form of slow productivity growth and high cost of compliance.	

	○ **Diversion of Funds:** A large part of taxes raised for environmental purposes are being diverted or lying unutilized. ○ **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.	
17.	**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. – NbS builds resilience of the underserved and vulnerable urban communities who are most affected by climate change induced catastrophes. **Types Of NbS:** – **No or minimal intervention in ecosystems.** – 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. – **Some Interventions in Ecosystems and Landscapes:** – This type of NBS is strongly connected to concepts like natural systems agriculture, agro-ecology, and evolutionary-orientated forestry. – **Managing Ecosystems in Extensive Ways:** – It is linked to concepts like green and blue infrastructures and objectives like restoration of heavily degraded or polluted areas and greening cities. – **India and NBS:** – India launched its first **National Coalition platform for Urban nature**-based solutions (NbS) under the **Cities4Forests initiative**.	
18.	**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** **Organic-Carbon Rich Fertilisers:** – Fertilisers such as compost and **solid manure with wide C:N (carbon:nitrogen) ratios** will have a **slow carbon turnover** compared to other materials. **Biofuel over Fossil Fuels:** Nearly all biofuel systems (mainly biodiesel and bioethanol) produce fewer GHG emissions than fossil fuels	
19.	**Plastic-Waste Management**	
	– India is generating about 3.5 million tonnes of plastic waste annually. – Right from municipal solid waste, plastic waste, to automobile waste, the amount of waste is expected to be 3 times by 2025 – Single use plastics – Single-use plastic has among the highest shares of plastic manufactured and used — from packaging of items, to bottles (shampoo, detergents, cosmetics), polythene bags, face masks, coffee cups, cling film, trash bags, food packaging etc. – Plastics are primarily produced from crude oil, gas, or coal, and 40% of total plastic is discarded after a single use. **Issues Associated with Plastic-Waste in India** – More Plastic Per Person – became ubiquitous in everyday use – Unsustainable Packaging – along with the growing trend of consumerism – Online Delivery - popularity of online retail and food delivery apps, though restricted to big cities, is contributing to the rise in plastic waste – for example, Swiggy and Zomato are each reportedly delivering about 28 million orders a month. – Upsets the Food Chain - affect the world's tiniest organisms, such as plankton. When these organisms become poisoned due to plastic ingestion, this causes problems for the larger animals that depend on them for food.	

- Impact on Human Health – WHO published shocking research in 2018 that exposed the presence of microplastics in 90% of bottled water - Plastic toxicity in humans can lead to hormonal disruption and adverse reproductive and birth outcomes.
- Microplastics pollution of the oceans

Steps taken by India

National Dashboard on Elimination of Single Use Plastic and Plastic Waste Management

- A nationwide awareness campaign on Single Use Plastics on World Environment Day in June 2022 - A mobile app for Single Use Plastics Grievance Redressal was also launched to empower citizens to check sale/usage/manufacturing of SUP in their area and tackle the plastic menace.

Plastic Waste Management Amendment Rules, 2022

- It prohibits the manufacture, import, stocking, distribution, sale and use of several single-use plastic items as of July 1, 2022 - also mandated Extended Producer Responsibility (EPR) that incorporates circularity by making manufacturers of products responsible for collecting and processing their products upon the end of the products' lifetime.

India Plastics Pact

- It is the first of its kind in Asia. The Plastics Pact is an ambitious and collaborative initiative to bring stakeholders together to reduce, reuse and recycle plastics within the material's value chain.

Mascot 'Prakriti'

- To spread awareness among masses about small changes that can be sustainably adopted in lifestyle for a better environment.

Project REPLAN

- Project REPLAN (stands for REducing PLastic in Nature) launched by Khadi and Village Industries Commission (KVIC) aims to reduce consumption of plastic bags by providing a more sustainable alternative.

Effective Solutions to Plastic-Waste Management

- Identifying Hotspots - associated with production, consumption, and disposal of Plastic can assist governments in developing effective policies that address the plastic problem directly.

	– Designing Alternatives – to be replaced with non-plastic, recyclable, or biodegradable materials is the first step - Promoting the use of Oxo-biodegradable plastics – Breaking Down Plastic Waste – use of technology like Plastic-eating bacteria, discovered in Japan – Recycling through Technologies and Innovation – capacity building and augmentation of plastic recycling industry - Thiagarajar College of Engineering in Madurai has received a patent for manufacturing tiles and blocks from waste plastic. – Promoting a plastic-free workplace – individually, organisationally and culturally – Circular Economy for Plastic Management - recaptures "waste" as a resource to manufacture new materials and products - applicable to the global currents of plastic and clothes, but can also contribute significantly to the achievement of sustainable development goals. – Multi-stakeholder collaboration - Government ministries at the national and local levels must collaborate in the development, implementation and oversight of policies, which includes participation from industrial firms, non-governmental organisations and volunteer organisations.	

20.	**Vulnerability Profile of India**	
	– Around 59% of the landmass is prone to earthquakes of moderate to very high intensity. – About 12% (over 40 million hectares) of its land is prone to floods and river erosion. – Close to 5,700 kms, out of the 7,516 kms long coastline is prone to cyclones and tsunamis. – 68% of its cultivable area is vulnerable to droughts; and, the hilly areas are at risk from landslides and avalanches. – Moreover, India is also vulnerable to chemical, biological, radiological and nuclear (CBRN) emergencies and other man-made disasters. – Disaster risks in India are further compounded by increasing vulnerabilities related to changing demographics and socio-economic conditions, unplanned urbanization, development within high-risk zones, environmental degradation, climate change, geological hazards, epidemics and pandemics.	
21	**Disaster Management- Stages**	
	A disaster management cycle consists of four phases, namely, preparedness, response, Recovery and Mitigation. Through various steps like constitution of National Disaster response fund and setting up of 12 battalions of National Disaster Response force under Disaster Management, government response had always been reactive. These steps focus only on response and Recovery.  **Mitigation steps taken by the Government:** – National disaster mitigation fund: The government has decided to set-up such a fund to implement a May 2016	

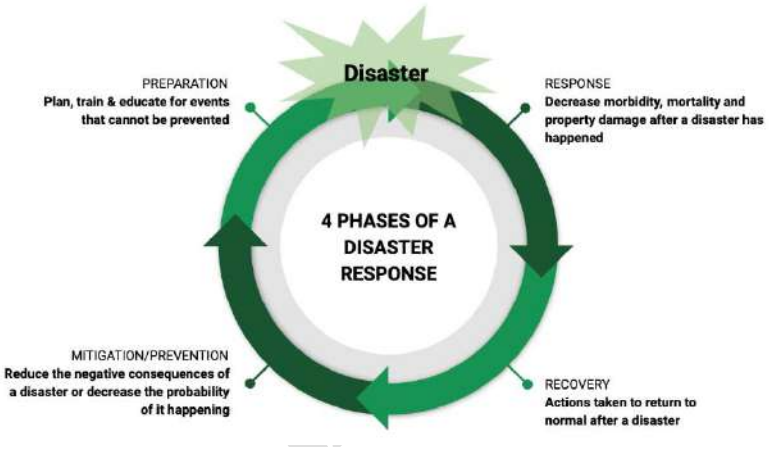
Supreme court Judgement as a part of National Disaster Management Plan, 2016. The 15th Finance commission has recommended a National Disaster Risk Management Funds(NDRMF) and SDRMF in this regard.

- National disaster Risk Index: developed jointly by MHA and UNDP. It maps hazards & vulnerabilities including economic vulnerabilities across 640 districts and all states including UTs. The index factors in exposure of population, agriculture & livestock and environmental risk.
- E-course on Vulnerability Atlas of India- Developed by the Ministry of Housing and Urban Affairs(MoHUA). It is a unique course that offers awareness and understanding about natural hazards, helps identify regions with high vulnerability with respect to various hazards and specifies district-wise level of damage risks to the existing housing stock.
- 'National Migrant Information System (NMIS)': developed by NDMA. It is an online dashboard, which would maintain a central repository of migrant workers and help in speedy inter-state communication to facilitate the smooth movement of migrant workers to their native places.
- Satellite support: IRNSS and Gagan systems have been developed by ISRO which can prove effective in disaster response.
- South Asian Flash Flood Guidance System (FFGS) launched by IMD, which is aimed at helping disaster management teams and governments make timely evacuation plans ahead of the actual event of flooding.
- "Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS)" during 2017-2020 and establishment of National Facility Airborne Research during 2020-21 and beyond.
- National Facility for Airborne Research (NFAR): developed by M/o Earth Sciences and IITM, Pune. Under this a state-of-the-art research aircraft equipped with instruments will be used for atmospheric research.
- 1st 'National Conference on Coastal Disaster Risk Reduction and Resilience (CDRR&R) – 2020': Organised by National Institute of Disaster Management (NIDM), in New Delhi.

- Indian Tsunami Early Warning System (ITEWS) was established in 2007 and is based at & operated by INCOIS, Hyderabad. It is an integrated effort of different organizations including the DOS),DST, the CSIR, Survey of India (SOI) and National Institute of Ocean Technology (NIOT).
- Intergovernmental Oceanographic Commission (IOC) of UNESCO (also known as UNESCO-IOC) has approved the recognition of two communities of Odisha viz., Venkatraipur and Noliasahi as Tsunami Ready Communities. It promotes preparedness and participation of public, community leaders, and national and local emergency management agencies.

Preparedness steps taken by the Government:

- Urban Development Programs: Smart Cities Mission, AMRUT and Heritage City Development and Augmentation Yojana(HRIDAY). SDG - 11 Sustainable cities.
- First Resilient Kerala Program: Launched by the Government of India, the Government of Kerala. The World Bank have signed a Loan Agreement of USD 250 million. It aims to enhance the State's resilience against the impacts of natural disasters and climate change.
- Coalition for Disaster Resilient Infrastructure (CDRI): Announced in 2020 Budget, proposed by PM, it will act as a convening body that will pool best practices and resources from around the world for reshaping construction, transportation, energy, telecommunication and water, so that building in these core infrastructure sectors factors in natural catastrophes.
- PM CARES fund: For the preparedness of the COVID-19 waves.
- National Disaster management guidelines 2014 for SEISMIC RETROFITTING OF DEFICIENT BUILDINGS AND STRUCTURES.
- Financial Preparedness: through Accidental insurance(PM Suraksha Bima and PM Jeevan Jyoti Bima), Crop insurance to prepare for agricultural droughts(PM Fasal Bima Yojana).
- Drought Toolbox: United Nations Convention to Combat Desertification (UNCCD) is currently testing a drought toolbox which uses a total of 15 to 30 different parameters

	to assess drought risk and vulnerability of a geographical region. – Forest fires: The upgraded version of the Forest Fire Alert System (FAST 3.0) was released in January, 2019 with a separate activity of monitoring large forest fires.	
22.	**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	
23.	**Meeting the Disasters, sustainably**	
	– Context - Recently, the G20 has announced its second meeting of the Disaster Risk Reduction Working Group (DRRWG). **State of Disaster Impact** – In the current World Risk Index, four out of top 10 vulnerable countries are G20 nations. – The combined estimated annual average loss in G20 nations is $218bn, equal to 9% of their total average annual infrastructure investment. – India came in third place after USA and China among the top 50 nations most in danger from the effects of climate change in 2050, according to the XDI Assessment Report 2023. – India is among the world's most disaster-prone countries with 27 of its 29 states and seven union territories exposed to recurrent natural hazards such as cyclones, earthquakes, landslides, floods and droughts. As per statistics, India as a whole is vulnerable to 30 different types of disasters that will affect the economic, social, and human development potential. – Centre for Science and Environment (CSE) report of 2022 says India has witnessed a climate change-induced natural disaster almost every day in 2022. – These disasters have claimed about 2,755 lives, affected almost 1.8 million hectare of crop area, destroyed over 416,667 houses and killed close to 70,000 livestock - These include Amarnath floods, up Floods, Manipur Landslides, Cyclone Asani, Uttarkhanad Avalanche, etc.	

Key Priority areas for G20 DRRWG

- Early warning systems to all - treating such systems as global public goods - focusing on differential strategies to deal with extensive risk and intensive risk.
- Improving Financing frameworks for national DRR - Innovative financing tools like reserve funds, dedicated lines of credit and tapping global resources, green financing
- Improving systems and capabilities for response to disasters - by meaningful convergence of disaster risk reductions and climate change adaptation
- Application of ecosystem-based approaches to disaster risk - by treating disaster risk reduction as multi-tiered, multi sectoral effort and integrating the efforts vertically from local to sub-national, national and global and horizontally across sectors

Steps Taken

At the International level

- G20's Disaster Risk Reduction Working Group 2023 - focuses on encouraging collective work by the G20, undertaking multi-disciplinary research and exchanging best practices on disaster risk reduction.
- Global Platform for Disaster Risk Reduction, 2022 (GP DRR 2022) - outcome was summarised in the Bali Agenda for Resilience. Its theme was "From Risk to Resilience: Towards Sustainable Development For All in a Covid-19 Transformed World." It focused on:
  - A whole-of-society approach to Disaster Risk Reduction (DRR), ensuring no one is left behind.
  - To keep DRR at the core of development and finance policies, legislation and plans to achieve the 2030 Agenda for Sustainable Development.
  - Limiting greenhouse gas emission levels below mitigation capacity, to reduce frequency and intensity of catastrophic events.
  - Both DRR and climate change adaptation aim at reducing vulnerability and enhancing capacity as well as resilience.
- The Coalition for Disaster Resilient Infrastructure (CDRI) 2016 - an international coalition of countries, United Nations (UN) agencies, multilateral development banks, the private sector, and academic institutions, that aims to

promote disaster-resilient infrastructure - launched by the Indian PM at the 2019 UN Climate Action Summit in September 2019 - Its objective is to promote research and knowledge sharing in the fields of infrastructure risk management, standards, financing, and recovery mechanisms.

- Sendai Framework 2015 - adopted at the Third United Nations World Conference on Disaster Risk Reduction, held in 2015 in Sendai, Miyagi, Japan. The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) - the present Framework applies to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters caused by natural or man-made hazards, as well as related environmental, technological and biological hazards and risks.
- The United Nations International Strategy for Disaster Reduction (UNISDR) - a global framework established within the United Nations for promoting action to decrease social vulnerability and natural hazards risks and related technological and environmental disasters.

India's Initiatives

- India adopted the Sendai framework for disaster risk reduction and the first country to have drawn a national and local strategy with a short-term goal achievement target set for 2020.
- Disaster Risk Governance is rooted in the Disaster Management Act of 2005, the scope of legislative provisions was expanded by the implementation of the 2009 National Policy on Disaster Management, intended to enforce an enabling environment for all in recognition of the importance of State and District level authorities.
- In 2016, the National Disaster Management Plan was also released to further align the institutional frameworks and mechanisms with the Sendai Framework for Disaster Risk Reduction (SFDRR). The NDMP was further updated in 2019 with the intention to further coherence with the whole of post-2015 development agenda by integrating not only the SFDRR but also the Sustainable Development Goals (SDGs) and Paris Agreement.
- Formation of National Disaster Response Force (NDRF), which comprises 144 special teams trained in response

for events originating from natural hazards, with 72 teams specializing in chemical, biological, radiological and nuclear calamities.

- Prime Minister's Ten Point Agenda for DRR, social inclusion as a cross-cutting principle for all activities and mainstreaming DRR as a cornerstone of all development.
- To mainstream DRR into the education sector through structural and non-structural provisions. This includes the National School Safety Program, launched in 2011 by the NDMA, through a centralized approach.
- Checklist for Natural Disaster Impact Assessment which requires all new projects costing over one billion rupees to undergo an evaluation of both the estimated effects of hazards on the project alongside the risks of new hazard-related impacts as a result of the project.
- This is further supported by the Ministry of Finance's Guidelines (2009) which highlight the need for all projects that involve structural assets, including any changes to existing land-use plans, require additional costs to be allocated towards prevention or mitigation of natural and/or man-made hazards.
- National Disaster Response Fund, and mandated the formation of State Disaster Response Fund by the state and union territory authorities - can support States in largescale disaster recovery and reconstruction.
- Coalition for Disaster Resilient Infrastructure Society (CDRIS) - a global partnership of national governments, United Nations agencies and programmes, multilateral development banks and financing mechanisms, the private sector, and academic and research institutions.

Way Forward

- Insurance: To boost resilience, insurance products that cover both house and household assets are needed for climate resilience - State may have to intervene to address the needs of those with the lowest purchasing power - Housing insurance for the poor be launched on the lines of Agriculture insurance schemes.
- Minimising Response Time - between exposure to climate risk and the accrual of benefit is necessary whether from the State or insurance firms.
- The direct benefit transfer (DBT) architecture can be leveraged.

	– Integrated Approach - Across six policy areas (social protection, public health, livelihood, housing, community infrastructure, and urban planning) at different scales (household, community, and city levels). – Three enabling factors – o capable, accountable, and responsive governance; o climate and urban data; o climate and urban finance – Data Governance: Satellite imagery to identify flooded areas, and government databases to identify beneficiaries can be collaborated. – Role of Local Governments - City governments are the drivers for addressing risks by providing basic services which are critical to improving the resilience of the urban poor. – Public Participation - People are the first responders to any climate risk and their active support will enhance risk reduction before any major damage. – Financial Independence and Higher financial support is needed through devolution of funds, functions and functionaries.	
24.	**DRR- Sendai Framework**	
	Why is Sendai Framework different? – For the first time the goals → outcome-based targets – Governments at the Centre of DRR – Shift from disaster management to addressing disaster risk management – Equal importance on all kinds of disasters (not only natural hazards). – In addition to social vulnerability→considerable attention to environmental aspects – Disaster risk reduction to be seen as a policy concern that cuts across many sectors, including health and education	

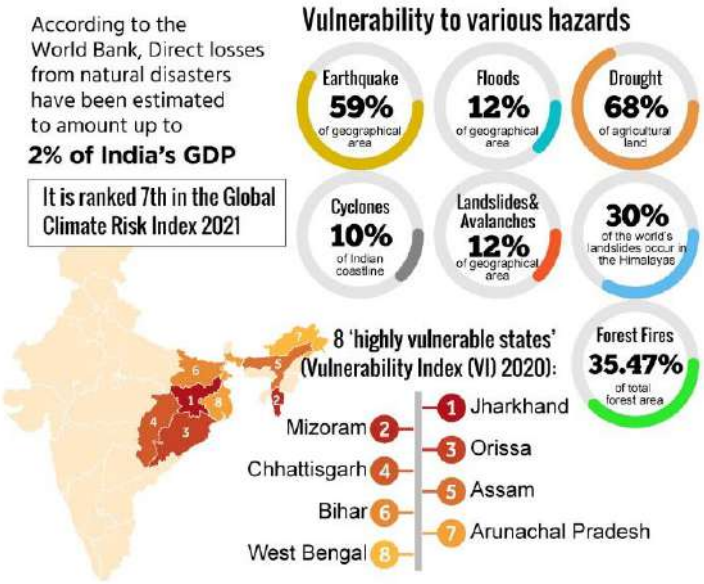
Issues:

- Funding Commitment is lacking at Global Levels
- No clear definition of gender is offered: Fails to understand the intersectionality of Gender and Women in Disaster Management
- Monitoring compliance with the Sendai Framework
- District level measures for Safe Building Practices is lacking
- Poor co-ordination at the local level, lack of early-warning systems,
- paucity of trained dedicated clinicians, lack of search and rescue facilities and poor community empowerment

25. Vulnerability profile of India

For Data on the Risk Profile of India refer this figure:
According to the different types of losses, the vulnerability can be defined as;

- **Physical Vulnerability**: meaning the potential for physical impact on the physical environment
- **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;
- **Environmental vulnerability**: the potential impacts of events on the environment (flora, fauna, ecosystems, biodiversity).

	– **Attitudinal Vulnerability**: A community which has negative attitude towards change and lacks initiative in life resultantly become more and more dependent on external support.  	
26.	**Kerala floods**	
	Causes – Unplanned development: Encroachment, failure of flood control structures, unplanned reservoirs, – Natural causes: Climate change aggravating flood problems, degradation of river catchment and heavy siltation. – Rapid urbanization: Indiscriminate settlements on water bodies and wetlands leading to inadequate capacity of drains. – Lack of pre-disaster planning: Largely neglected – Failure in compliance to expert recommendation: Gadgil Committee's suggestion on declaring certain area as environmentally sensitive zones were ignored. **Threat of flooding** – Loss of life and property – Inundation of agricultural land → loss of crops → threat to food security – Social issues: People rendered homeless – Health issues: Spread of diseases like cholera, hepatitis and other water-borne diseases.	

	– Stress on budget: Flood relief fund and need to rebuild. **Links with climate change** – Change in climatic patterns like rainfall due to monsoon which is dependent on several factors like ENSO, Indian Ocean Dipole etc – Erratic rainfall making it hard to predict and be prepared. – Melting of glaciers → Increased flow in rivers – Disappearance of lakes due to climate change leading to unregulated flow of rivers at times. – Traditional weather prediction equipment is getting irrelevant with unknown factors of climate change playing a part → **Way ahead** – Improving forecasting techniques – Developing a comprehensive flood management plan – Complying with Disaster Risk Reduction guidelines on prevention, preparedness and mitigation.	
27.	**Flood plain zoning**	
	Concept – An effective non-structural flood management measure where land in flood plains is regulated in order to restrict damage caused by floods. **National Floodplains Zoning Policy** – Flood Plain Zoning was recognized as an effective non-structural measure for flood management under the guidelines issued by NDMA. – Flood prone areas are being mapped under the policy across different states: Almost 50 million hectares is flood prone in the country. – Jal Shakti Ministry has been telling the States the need to adopt the approach. – Features: • Determining the developmental activities – to build database • 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. • Uses: Besides occasional floods, it also helps in decreasing damage caused by drainage congestion, especially in urban ares. – NMCG(Clean Ganga) is also aligned to the policy. **Recent developments** – Though many states have enacted the policy, they are yet to undertake delineation and demarcation of flood plains. – 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. NMCG has advised all states in Ganga basin for demarcation, delineation and notification of river flood plains.	
28.	**Global Platform for Disaster Resilient Infrastructure (CDRI)**	
	Relevance – From risk to resilience: Towards sustainable development for all in a world transformed by the pandemic. – **Disaster resilient Infrastructure**: Infrastructure that can stand any huge damage from any kind of natural disaster is known as Disaster Resilient Infrastructure • 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. • Non-structural measures refer to risk-sensitive planning, enabling institutional frameworks, hazard mapping, ecosystem-based management, and disaster risk financing. **Outcomes of GPDRR 2022(summarised in Bali Agenda for Resilience)** – Need for a "whole-of-society" approach to ensure no one is left behind. – DRR as the core of development and finance policies and legislations to achieve 2030 SDGs – 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.	

	– GPDRI 2022's suggestions • Greater resource allocation for grounded local action • More focus on building resilience and sustainable livelihoods focusing on community level. • Greater accountability and transparency in relief and rehabilitation efforts. **Other initiatives:** – Sendai Framework: Stressed – Climate Risk and Early Warning Systems(CREWS) – Coalition for Disaster Resilient Infrastructure Society (CDRIS). • Disaster Risk Assessment • Standards of design and implementation • Financing new infra and mechanisms to cover risks • Reconstruction and recovery of infra after disasters	
29.	**Flash floods**	
	At least 13 people were killed and scores more were missing when flash floods triggered landslides at the Baltal base camp in the Ganderbal district. **Flash Floods** – A flash flood is a quick flooding of low-lying geomorphic features such as washes, rivers, dry lakes, and basins. Heavy rain connected with a strong thunderstorm, hurricane, or tropical cyclone, or meltwater from ice or snow pouring over ice sheets or snowfields, can all create it. Flash floods can occur as a result of the collapse of a natural ice or debris dam, or of a man-made structure, such as a dam. – Flash floods are very localised, short-duration occurrences with a very high peak, with fewer than six hours between the occurrence of the rainfall and the peak flood. **Flash Floods in India** – According to the World Meteorological Organization, flash floods account for 85 percent of flooding incidences worldwide, resulting in around 5,000 deaths each year. – While the standard flood warning system is completely developed, India has yet to build a viable flash flood warning system.	

- In India, the Central Water Commission (CWC), which monitors dams, is currently warning of rising water levels in reservoirs, which are normally seen as warnings of impending floods.
- Recently, CWC collaborated with Google to create a software application that visualises rising water levels following heavy rains.

Causes

- exceptionally high rainfall from thunderstorms - dam or levee failures and/or mudslides (Debris Flow).
- locations on or near volcanoes after eruptions, when glaciers have been melted by the extreme heat.
- The strength of the rainfall, the location and distribution of the rainfall, land use and terrain, plant kinds and growth/density, soil type, and soil water content all impact how soon and where Flash Flooding may occur.

New Role for India

- WMO identified India as the nodal centre for building a tailored model to provide flood warnings to Asian nations such as Vietnam, Sri Lanka, Myanmar, and Thailand.
- The model's is Flash Flood Guidance System.
- The Ministry of Earth Sciences' Indian Meteorological Department (IMD) will endeavour to personalise this weather model.
- Several Southeast Asian countries, including India, rely on the monsoon and are vulnerable to its whims.
- India presently has its own tsunami warning system, which also serves as a backup warning system for numerous Asian countries.

Flash Flood Guidance Services (FFGS)

- In 2020, the India Meteorological Department (IMD) debuted the South Asian Flash Flood Guidance System (FFGS).

Flash Flood Guidance System

- The model will anticipate probable floods by assessing the chance of rainfall and soil moisture levels - forecasts will be made using a combination of satellite mapping and ground-based observation - a customised weather model to warn about flash floods at least six hours in advance.

Need of the System

- According to World Meteorological Organization (WMO) data, flash floods kill around 5,000 people worldwide each

year. Despite such high mortality, there is no reliable flash flood forecasting or warning system.

- According to the Secretary of the Ministry of Earth Sciences (MoES), the frequency of extreme rainfall events has risen owing to climate change, and South Asia is particularly vulnerable to flash floods.
- Unpredictable weather contributes to up to 80% of natural disasters in all of these South Asian nations. Among these, flash floods cause significant loss of life and property.
- Furthermore, the influence across South Asia is multiplied by the varied geography - mountains, seas, the Eastern and Western Ghats, Myanmar highlands, and so on.
- The India Meteorological Department has extremely sophisticated processing capacity, numerical weather prediction, a wide observational network (ground, air, and space-based), and a globally regarded Weather Forecasting System.

Causes of floods in India

- Seasonality - The rainy season is concentrated in a short period of 3-4 months. It causes rivers to overflow, resulting in severe floods at times.
- Cloud Burst - Heavy rain and, at times, cloud bursts in the hills or upstream flood the rivers. If the rivers receive 15cm or more of rain in a single day, they begin to overflow. This impacts the Western Ghats coast, Assam, sub-Himalayan West Bengal, and the Indo-Gangetic plains.
- Silt accumulation - The Himalayan Rivers, which have vast components, bring in a big amount of silt and sand, which eventually accumulates with no clearance activities taking place for years. As a result, the rivers' water carrying capacity is dramatically diminished, resulting in floods. For example, Jhelum floods.
- Obstruction - Floods are generated by the building of embankments, canals, and railway-related operations.
- Deforestation - Trees are essential for holding the surface of mountains and creating natural barriers for rainwater. As a result of deforestation on hill slopes, river water levels unexpectedly rise, producing floods.

- Town Planning - The phenomenon of urban floods, as seen in Mumbai, Chennai, Bengaluru, and Srinagar, is a new addition to this.
- The main reason is rapid migration from rural to urban areas, which has put enormous strain on land, the inability of civic authorities to control encroachment on land, which is a traditional outlet for overflowing rivers, bad planning, and corruption.
- Monsoon Pattern - These effects are exacerbated by an irregular monsoon pattern, unseasonal rainfall, or even a disruption in the usual Monsoon periodicity.

Steps taken by the Government for Flood Control Management:

Forecasting Flood

- It entails providing advance notice of the advent of floods. It is extremely beneficial in taking prompt action to reduce the loss of human life, animals, and transportable property. The Central Water Commission began flood forecasting in November 1985, with the establishment of the first flood forecasting station near Delhi's old railway bridge.
- There are already 175 flood forecasting stations on various rivers around the country. The flood forecasting network encompasses flood-prone states and UTs, with stations issuing daily flood alerts from May to October.

Run-Off Reduction

- It is one of the most effective flood control measures. Runoff can be decreased by encouraging and enhancing surface water penetration into the earth in catchment regions. This can be accomplished by large-scale afforestation, particularly in higher catchment regions.

Dam Construction

- Dams and multi-purpose projects are being built across rivers to store excess water in reservoirs. Several similar reservoirs were built under the first five-year plan. Many dams were built in following schemes to decrease run-off and store and release water under regulated settings.

Channel Improvements and Embankment Construction

- The flood-prone river channels are upgraded by deepening and expanding. These rivers' water is also channelled into canals.
- The government have built a number of embankments along rivers to lessen the threat of flooding. Along the Brahmaputra, Krishna, Godavari, Gandak, Kosi, Narmada, Tapi, son, Sutlej, and their tributaries, such embankments have been built.

Zoning for Flood Plains

- It is also a key step in controlling floods that are based on flood plain knowledge, notably the identification of floodways' in connection to land development.

Way Forward

- Monitoring the glaciers on a regular basis
- Structural and geotechnical remedies
- Alarm systems can also be installed at lakes to alert the communities downstream if an overflow occurs.
- However, no scientific method can be used to plan or regulate rain patterns.
- To manage floods, it must be viewed in context of environmental deterioration, global warming, and inadequate governance at all levels.
- Priority should be given to cleaning drains and rivulets near cities.
- The construction of embankments, flood barriers, ring bunds, and flood control reservoirs should be done scientifically.
- There is no clear legislative definition of flood control. It is not featured as a subject in any of the country's legislative lists, such as the Union, State, or Concurrent lists - Issues with drainage and embankments are addressed under Entry 17 of List II of the State List. As a result, preventing and combating floods is essentially the duty of state governments.
- The Centre-states system should be developed further, with an emphasis on increased coordination. This must be a constant and continuing system, rather than one that simply activates after a disaster. Various flood-control measures should be implemented by the Centre and the states through a coordinated strategy.

30.	**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. **Objective:** Promote research and knowledge sharing in the fields of infrastructure risk management, standards, financing, and recovery mechanisms. **Significance:** ● India's second major global initiative after the ISA and it demonstrates India's leadership in climate change and disaster resilience issues. ● to obtain a global leadership role in climate change matters and were termed as part of India's stronger branding. ● Can provide a safer alternative to China's Belt and Road Initiative (BRI). **Strategic priorities:** ● Technical Support and Capacity-building: This includes disaster response and recovery support; innovation, institutional and community capacity-building assistance; and standards and certification. ● Research and Knowledge Management: This includes collaborative research; global flagship reports; and a global database of infrastructure and sector resilience. ● Advocacy and Partnerships: This includes global events and initiatives; marketplace of knowledge financing and implementation agencies; and dissemination of knowledge products.	
31.	**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" **Need for such a Plan** ● India has been vulnerable due to its unique geo-climatic and socio-economic conditions. ● SOPs are virtually non-existent and inefficient ● inadequate coordination among various government departments and other stakeholders.	

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

	• Geomorphology • Historical rate of relative sea-level change. **Importance** • 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.	
33.	**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
- **Cyclone Sheltering** – At national, state and regional level, the construction of cyclone shelters should be taken up to help the vulnerable community from cyclones.

Flood Management

- **Vegetation Cover Improvement** – To increase the water infiltration capacity, improving vegetation cover is of high importance.
- **Mangrove Plantation**
- **Saline Embankment**
- **Levees** – They act as an obstruction to the wind forces and also provide a shelter during floods.
- **Artificial Hills** – These act as the refuge during flooding, and should be taken up in the right areas.
- **Awareness of the public**

India's Cyclone Disaster Management Initiatives

- National Cyclone Risk Mitigation Project
- India initiated this project to undertake structural and non-structural measures to mitigate the cyclone's effects.
- Integrated Coastal Zone Management (ICZM) Project
    - It aims to bring a comprehensive plan to manage coastal areas
- Coastal Regulation Zones (CRZ)
- IMD's Colour Coding of Cyclones
- It is a weather warning that is issued by the IMD to aware people ahead of natural hazards.

34.	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

Disaster Preparedness

- Advocacy/ awareness→Assessment/ Analysis→Capacity building
  Co-ordination and partnership→Miscellaneous like shelter, water availability, sanitation, conservation, mock drills, etc.

Disaster Response

- 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

RECOMMENDATIONS

- Specific Code of conduct for NGOs
- Quality of service
- Popularize volunteerism
- Mandatory training of NGO members
- Establishment of coordinating agencies
- Mock drills
- Revision of allowances and funds for NGOs