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INSTA MAINS 2022 EXCLUSIVE

DISASTER MANAGEMENT

NOTES

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1. What is Disaster Management?

The Disaster Management Act of 2005 defines Disaster Management as an integrated process of planning, organizing, coordinating and implementing measures which are necessary for:

1. Prevention of threat of any disaster
2. Reduction of risk of any disaster or its consequences
3. Readiness to deal with any disaster
4. Promptness in dealing with a disaster
5. Assessing the severity of the effects of any disaster
6. Rescue and relief
7. Rehabilitation and Reconstruction

Organisations related to Disaster Management Framework at the National Level:

1. National Disaster Management Authority of India (NDMA).
2. National Disaster Management Plan (NDMP).
3. SDMA.
4. District Disaster Management Authority (DDMA).

Policies/initiatives:

1. India is a signatory to **the Sendai Framework for Disaster Risk Reduction.**
2. India is one of the participating countries and works closely with the United Nations International Strategy for Disaster Reduction (UNISDR).
3. **National Disaster Management Plan (NDMP)** defines the roles and responsibilities of various stakeholders including Central Ministries/ Departments, State Governments, UT Administrations, District Authorities and local self-Governments.
4. **National Disaster Management Services (NDMS)** was conceived by NDMA during 2015-16 for setting up of Very Small Aperture Terminal (VSAT) Network connecting MHA, NDMA, NDRF etc. to provide the failsafe communication infrastructure and technical support for Emergency Operation Centre (EOC) operations across the country.
5. **Landslide Risk Mitigation Scheme (LRMS)** envisages financial support for site specific Landslide Mitigation Projects.

2. Disaster Management Act

Since March 24, 2020, the Ministry of Home Affairs (MHA) has been issuing orders and guidelines for the containment of Covid-19 under **the Disaster Management Act, 2005.**

Under what section of The Disaster Management Act has the MHA been issuing orders on containment measures for Covid-19?

It is under **Section 10 of The Disaster Management Act** that the Union Home Ministry has been issuing guidelines for the containment of Covid-19.

Section 10 of The Disaster Management Act deals with the powers and functions of this national executive committee.

Section 51 of the Disaster Management (DM) Act, 2005:

The Section prescribes **"punishment for obstruction" for refusal to comply with any direction given by or on behalf of** the Central government or the State government or the National Executive Committee or the State Executive Committee or the District Authority under the Act.

Background:

The DM Act, 2005, came into existence after the 2004 tsunami.

On March 24, 2020, the Centre, through **the National Disaster Management Authority (NDMA) headed by the Prime Minister,** invoked the provisions of the Act to streamline the management of the pandemic, empowering district magistrates to take decisions and centralise other decisions on the supply of oxygen and movement of vehicles.

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About the Disaster Management Act, 2005:

- The stated object and purpose of the DM Act is to manage disasters, including preparation of mitigation strategies, capacity-building and more.
- It came into force in India in January 2006.
- The Act provides for "the effective management of disasters and for matters connected therewith or incidental thereto."
- The Act calls for the establishment of National Disaster Management Authority (NDMA), with the Prime Minister of India as chairperson.
- The Act enjoins the Central Government to Constitute a National Executive Committee (NEC) to assist the National Authority.
- All State Governments are mandated to establish a State Disaster Management Authority (SDMA).

Powers given to the Centre:

Power bestowed by DM Act on Central Government and NDMA are extensive.

- The Central Government, irrespective of any law in force (including over-riding powers) can issue any directions to any authority anywhere in India to facilitate or assist in the disaster management.
- Importantly, any such directions issued by Central Government and NDMA must necessarily be followed by the Union Ministries, State Governments and State Disaster Management Authorities.
- In order to achieve all these, the prime minister can exercise all powers of NDMA (S 6(3)). This ensures that there is adequate political and constitutional heft behind the decisions made.

3. Disaster Management Plan of Ministry of Panchayati Raj

Union **Minister of Panchayati Raj** has released **the "Disaster Management Plan of the Ministry of Panchayati Raj (DMP-MoPR)".**

Areas covered under the Plan:

1) Institutional arrangement for Disaster Management.
2) Hazard Risk, Vulnerability and Capacity Analysis.
3) Coherence of Disaster Risk Management across Resilient Development and Climate Change Action.
4) Disaster Specific Preventive and Mitigation Measures-Responsibility Framework.
5) Mainstreaming of Community Based Disaster Management Plan of Villages and Panchayats and so on.

Highlights of the plan:

- It aims to develop a culture of disaster resilience at the grassroots level among the Panchayats and Rural Local Bodies.
- It seeks to establish a framework to align the disaster management measures in rural areas to that of the National Disaster Management Authority (NDMA).
- Under the Plan, **every Indian village would have a "Village Disaster Management Plan" and every Panchayat would have their Disaster Management Plan.**
- All stakeholders including PRIs, elected representatives and functionaries of Panchayats etc. would participate in planning, implementation, monitoring and evaluation of the plan.

Need for Panchayati Level Plans:

Panchayat-level and village-level Disaster Management Plans to mitigate the challenges in the event of disaster form **a foundational level.**

The Panchayati Raj Institution (PRI), the representative body of the people, is the most appropriate institution from village to the district level in view of:

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- Its proximity.
- Universal coverage.
- Enlisting people's participation on an institutionalised basis.

Their close involvement will be able to make people more prepared for countering natural disasters as well as involve them in all possible preventive and protective activities so that the impact of the disasters are mitigated and the people are able to save their lives and property.

4. Early Warning System (EWS)

An Early Warning System (EWS) can be defined as a set of capacities needed to generate and disseminate timely and **meaningful warning information of the possible extreme events** or disasters (e.g. floods, drought, fire, earthquake and tsunamis) that threatens people's lives. The purpose of this information is to enable individuals, communities and organizations threatened to prepare and act appropriately and in **sufficient time to reduce the possibility of harm, loss or risk.**

Elements of Early Warning system

- **Risk Knowledge:** Risk assessment provides essential information to set priorities for mitigation and prevention strategies and designing early warning systems.
- **Monitoring and Predicting:** Systems with monitoring and predicting capabilities provide timely estimates of the potential risk faced by communities, economies and the environment.
- **Disseminating Information:** Communication systems are needed for delivering warning messages to the potentially affected locations to alert local and regional governmental agencies. The messages need to be reliable, synthetic and simple to be understood by authorities and public.
- **Response:** Coordination, good governance and appropriate action plans are a key point in effective early warning. Likewise, public awareness and education are critical aspects of disaster mitigation.

Role of early warning systems

- They prevent loss of life, as well as reducing the economic impact of natural hazards.
    - Increasing the availability of multi-hazard early warning systems and disaster risk information is one of seven global targets set by The Sendai Framework for Disaster Risk Reduction 2015-2030.
    - **Warning to fishermen** on coasts to not venture into seas.
- **Disaster preparedness:** Knowing about an impending danger can save lives and property. The cost of damage due to disaster in India, **every year is estimated to be $87 billion** due to cyclones, floods and droughts. This can be prevented to a great extent.
- **Protecting critical infrastructure:** This is especially true for Onshore windmills, nuclear plants close to coast, critical bridges in border areas that are at risk of damage due to disasters. It will impact the security and safety of the nation.
- **Diplomacy:** India's **Tsunami warning centre** in the Indian ocean under the aegis of **INCOIS**, has been helpful in disseminating information for littoral states of Indian ocean. This has helped in increasing soft power diplomacy and achieve leadership of India in the Indo-Pacific.
- **Saving biodiversity and wildlife:** Many endangered Rhinos in Assam were rehabilitated due to risk of flooding of Brahmaputra. In turn it can save the whole ecosystem and the biodiversity of the place.

Conclusion

A complete and effective early warning system comprises four inter-related elements, spanning knowledge of hazards and vulnerabilities through to preparedness and capacity to respond. Best practice early warning systems also have strong inter-linkages and effective communication channels between all of the elements. These must be the basis for a good early warning system for various kinds of disasters.

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5. International Conference on Disaster Resilient Infrastructure

ICDRI is the annual international conference of **the Coalition for Disaster Resilient Infrastructure (CDRI)** in partnership with member countries, organizations and institutions to strengthen the global discourse on disaster and climate resilient infrastructure.

CDRI is a multi-stakeholder global partnership of national governments, UN agencies and programmes, multilateral development banks, the private sector, academic and knowledge institutions.

Need for Disaster Resilient Infrastructure:

- The Sendai Framework for Disaster Risk Reduction (SFDRR) highlights the role of improved disaster resilience of infrastructure as a cornerstone for sustainable development.
- The SFDRR includes four specific targets related to loss reduction:
- Reduce global disaster mortality.
- Reduce the number of affected people.
- Reduce direct disaster economic loss.
- Reduce disaster damage to critical infrastructure.

Target (4) on infrastructure is an important prerequisite to achieving the other loss reduction targets set out in the framework.

6. Hydro-meteorological calamities

The Union Home Ministry has released data on fatalities caused due to **hydro-meteorological calamities.**
(Note: Hydro-meteorological calamities and hazards include flash floods, cloudburst and landslides).

Highlights:

1. Nearly 6,800 people lost their lives in the country over the past three years due to hydro-meteorological calamities.
2. West Bengal has recorded the highest deaths among all States.
3. The causes for these calamities include extreme rainfall events or cloudbursts.
4. These types of fatal landslip events are common almost every year, mainly in the Himalayan States, in the Western Ghats, and Konkan areas.

States' roles and responsibilities:
Under the Disaster Management Act, States were empowered to take action to prevent deaths due to natural calamities.

7. Coastal Erosion

According to the Ministry of Earth Sciences, Of the 6,907.18 km long Indian coastline of the mainland, about 34% is under varying degrees of erosion.

What is Coastal erosion?
It is the process by which local sea-level rise, strong wave action, and coastal flooding wear down or carry away rocks, soils, and/or sands along the coast.

15th Finance Commission recommendations:

1. Create a National Disaster Risk Management Fund (NDRMF) and State Disaster Risk Management Fund (SDRMF) comprising a Mitigation Fund at the National and State-levels (NDMF/SDMF).
2. Create a Response Fund at the National and State level (NDRF/SDRF) for the award NDMA may develop suitable norms for mitigation measures to prevent erosion and both the Union

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and the State Governments develop a policy to deal with the extensive displacement of people caused by coastal and river erosion.

Preparedness:
Indian National Centre for Ocean Information Services (INCOIS) has prepared and published an atlas of Coastal Vulnerability Index (CVI) maps for the entire coastline of India at a 1:100000 scale using data on sea level rise, coastal slope, shoreline change rate, coastal elevation, coastal geomorphology, tidal range and significant wave height.

8. State government report on Chennai's flood

Tamil Nadu state government has released a **report on the action taken by the government with regard to measures to prevent recurrence of flooding.**

What has the report said?
Causes for flooding:

1. Encroachments, faulty drainage systems and tampering of natural course of water had made the megapolis prone to flooding every year.
2. Rapid urbanisation of Greater Chennai and its peri-urban areas had led to massive changes in land use patterns, as residential areas had sprung up in farmlands.
3. The changes in land use patterns were done without making the required changes for a proper drainage system to manage the flow of surplus water from traditional tanks as well as flood waters from catchment areas.
4. Irrigation tanks were choked with waste, slush and debris, obstructing the flow of flood water. This also reduced the water-absorbing and groundwater recharging capacity of the marsh.

Measures suggested:
Chennai needs **an integrated flood management system** with proper facilities to drain excess rainwater and desilt channels to prevent floods.

- The report recommended an integrated road and street side storm water drainage network, straight cut diversion channels, macro storm water drains, check dams, barrages and anicuts as part of such a system.

Urban floods in India- an overview:
Urban flooding is the inundation of land or property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers.

- In many Indian cities, urban floods have become a frequent phenomenon in recent years.

Unscientific urbanization leading to Urban floods:
Natural factors:

1. Increasing downpour.
2. Cyclonic storms and thunderstorms.
3. occurrence of high tides impeding the drainage in coastal cities.

Anthropogenic factors:

1. Concretization.
2. Wiping out of the wetlands.
3. Poor Water and Sewerage Management.
4. Encroachment and Illegal constructions.
5. Deforestation.

Administrative factors:

1. Lack of flood control measures.

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2. Multiple authorities in a city but owning responsibility by none.

Measures needed:
Structural Measures:
1. Conservation of wetlands in urban areas like lakes, ponds, streams.
2. Construction of differential slope along sidewalks, roads to drain excess water into reservoirs.
3. Strengthening of Storm water drainage system.
4. Pre-monsoon desilting of all major drains to be completed by March 31 each year.
5. Every building in an urban area must have rainwater harvesting as an integral component of the building utility.
6. Concept of Rain Gardens to be incorporated in planning for public parks and on-site storm water management for larger colonies and sites those are to be developed.
7. Suitable interventions in the drainage system like traps, trash racks can be provided to reduce the amount of solid waste going into the storm sewers.

Non-structural Measures:
1. National Hydro-meteorological Network as per NDMA is needed for all urban cities in India.
2. Flood hazard assessments should be done on the basis of projected future scenarios of intensities and duration of rainfall and land use changes.
3. Better forecasting of rainfall events; timely dissemination of information to the mass- 'Nowcasting' alerts or real-time weather updates.
4. Restrict encroachments in natural drainage areas; clearance of river beds, proper implementation of Coastal Regulation Zone rules.
5. Provisions for flood-proofing of buildings
6. Storm water pollution control, i.e. source is controlled by imposing quality standards for wastewater and solid waste disposals in urban environments.

9. Assam Floods

Why floods are common in Assam?

- **Brahmaputra** is braided and unstable in its entire reach in Assam except for a few places. The main reasons behind the instability of the river are high sedimentation and steep slopes.
- **High percentage of flood prone region:** 31.05 lakh hectares of the total 78.523 lakh hectares area of the state is prone to frequent floods. And the reasons behind this high flood prone area percentage are both man-made and natural.
- **EARTHQUAKES/LANDSLIDES:** Assam and some other parts of the northeastern region are prone to frequent earthquakes, which causes landslides. The landslides and earthquakes send in a lot of debris in the rivers, causing the river bed to rise.
- **BANK EROSION:** Assam has also faced bank erosion around the Brahmaputra and Barak rivers as well as their tributaries. It is estimated that annually nearly 8000 hectares land is lost to erosion. Bank erosion has also affected the width of the Brahmaputra river, which has increased up to 15 km.
- **DAMS**: Among the man-made reasons, the key cause of floods in Assam region is releasing of water from dams situated uphill. Unregulated release of water floods the Assam plains, leaving thousands of people homeless every year.
- **Guwahati's topography —** it's shaped like a bowl — does make it susceptible to water logging.
- **Unplanned expansion of the urban areas** has led to severe encroachments in the wetlands, low lying areas, hills and shrinkage of forest cover.
- **The river also changes course frequently** and it's virtually impossible to contain it within embankments. The pressure of the surging water takes a toll on these walls.

How governments have tried to handle the situation? Where have they failed?

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Floods are a recurrent feature during the monsoons in Assam. In fact, ecologists point out that **flood waters have historically rejuvenated croplands and fertilised soil in the state's alluvial areas.**

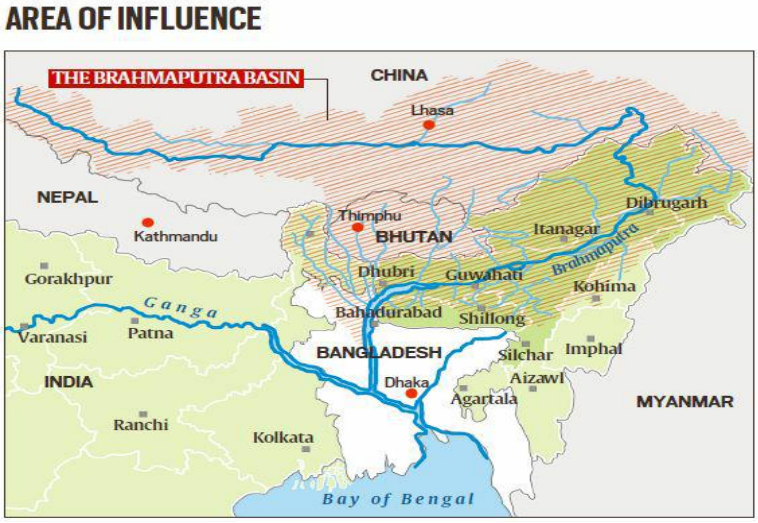
- But it's also a fact that for more than 60 years, the Centre and state governments have not found ways to contain the toll taken by the raging waters.

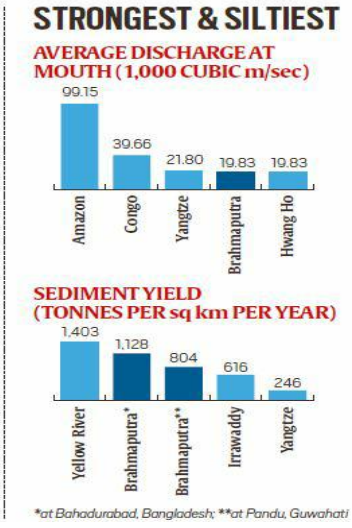
The state has primarily relied on **embankments to control floods.** This flood control measure was introduced in Assam in the early 1950s when the hydrology of most Indian rivers, including the Brahmaputra, was poorly understood.
But, several of the state's embankments were reportedly **breached by the floods this year.**

What needs to be done now?

1. **Studying the river and the impact of climate change** is a must to understand why the state gets flooded every year.
2. **Water flow information shared by China on the Brahmaputra with India,** for which India pays a certain amount, should also be shared with the public, as this will help in understanding the river better and therefore help people better prepare for floods.
3. **More accurate and decentralised forecasts of rain** can help in improving preparedness. Weather reports should be made available on district level and should be accessible to public.

Need for these measures:
As the economy of Assam is largely dependent on natural resources, what happens with agriculture and forests has direct effects on the livelihood of its people. During floods, water becomes contaminated, and climate change has a direct impact on the water resources sector by increasing the scarcity of freshwater, which is a constant problem in summer.





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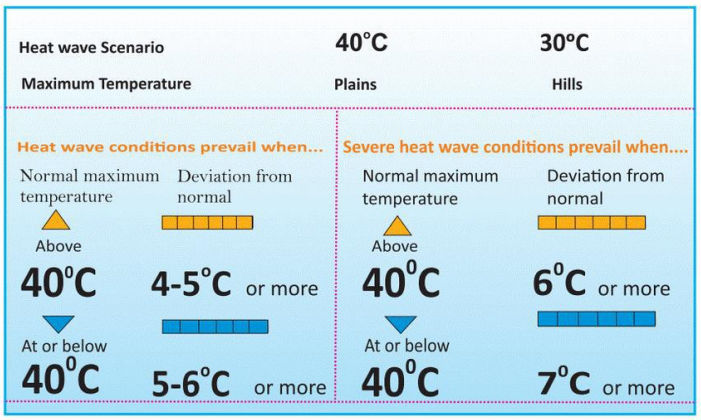
10. Heatwaves

Heat wave is a period of abnormally high temperatures, more than the normal maximum temperature that occurs during the pre-monsoon (April to June) summer season.



According to **Indian Meteorological Department**, Heat wave is considered if maximum temperature of a station reaches at least 40°C or more for Plains, 37°C or more for coastal stations and at least 30°C or more for Hilly regions.

India has been in the grip of what seems like **an eternity of heatwaves**. April temperatures over north-west and central India are the highest in 122 years.

Impacts of Heatwaves

On human health:

- Extreme heat can lead to dangerous, even deadly, consequences, including heat stress and heatstroke.
- Severe heat stroke can lead to multiple organ failure, seizures, and death.
- Children, the elderly and those with pre-existing morbidities are particularly vulnerable.
- Heat wave also cause death of cattle and wildlife besides affecting animals in various zoos in India.

Social:

- Heatwaves are associated with increased rates of heat stress and heat stroke, worsening heart failure and acute kidney injury from dehydration.
- Children, the elderly and those with pre-existing morbidities are particularly vulnerable.
- Promote the spread of diseases like cholera and dengue fever across endemic areas.
- Increased poverty due to failure of crops and reduced economic activities.

Economic:

- The **Lancet countdown on health and climate** has reported that India was particularly affected by the rising frequency of heatwave events and lost about 75 billion hours of work, a significant part of it in the agricultural sector.
- India lost nearly 75 billion hours of labour in 2017 as a result of rising temperatures.
- This made sustained work increasingly difficult and negatively affecting workers' output.
- The agriculture sector experienced the largest increase in labour loss.
- Almost 153 billion hours of labour were lost globally in 2017 due to heat, an increase of 62 billion hours from the year 2000.
- Agriculture sector was more vulnerable compared to the industrial and service sectors because workers there were more likely to be exposed to heat.
- Since 1990, every region of the globe has become steadily more vulnerable to extreme increases of heat.

Way forward:

- In 2016, the National Disaster Management Agency prepared guidelines for state governments to formulate action plans for the prevention and management of heat waves, outlining four key strategies:
    - Forecasting heat waves and enabling an early warning system

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    - Building capacity of healthcare professionals to deal with heat wave-related emergencies
    - Community outreach through various media
    - Inter-agency cooperation as well as engagement with other civil society organizations in the region.
- Scientific Approach:
    - Climate data from the last 15-20 years can be correlated with the mortality and morbidity data to prepare a heat stress index and city-specific threshold.
    - Vulnerable areas and population could be identified by using GIS and satellite imagery for targeted actions.
- Advance implementation of **local Heat Action Plans**, plus effective inter-agency coordination is a vital response which the government can deploy in order to protect vulnerable groups.
- This will require identification of "**heat hot spots**", analysis of meteorological data and allocation of resources to crisis-prone areas.
- The **India Cooling Action Plan** must emphasize the urgency and need for better planning, zoning and building regulations to prevent Urban Heat Islands.
- **Provision of public messaging** (radio, TV), mobile phone-based text messages, automated phone calls and alerts.
- Promotion of traditional adaptation practices, such as staying indoors and wearing comfortable clothes.
- Popularisation of simple design features such as shaded windows, underground water storage tanks and insulating housing materials.

11. Cyclone Management

Cyclone is a **region of low atmospheric pressure** surrounded by high atmospheric pressure resulting in swirling atmospheric disturbance accompanied by powerful winds. They occur mainly in the **tropical and temperate regions** of the world.

Increasing incidence of cyclones

- Although the **North Indian Ocean** (NIO) Basin (including the Indian coast) generates only about **7% of the world's cyclones,** their impact is comparatively high and devastating, especially when they strike the coasts bordering the North Bay of Bengal.
- On an average, **five to six tropical cyclones form every year,** of which two or three could be severe.
- More cyclones occur in the Bay of Bengal than the Arabian Sea and the ratio is approximately 4:1. This is **now changing due to impact of climate change.**
- Research evidence shows **more cyclones** forming **over the Arabian Sea** when compared to the Bay; overall there were eight storms of concern to India in 2019, and five last year, **Amphan being a super cyclone.**
- India has faced around 170 storms since 1970, which is the fourth highest after the United States, the Philippines and China in the same duration.

India's preparedness to handle cyclones

- **National Disaster Management Authority (NDMA)** has responsibility of formulating **National Guidelines for Management of Cyclones** and **India Meteorological Department (IMD)** is the nodal agency for providing cyclone warning services to communities and important officials in affected areas.
- The **National Cyclone Risk Mitigation Project (NCRMP),** to be implemented with financial assistance from the World Bank, is envisaged to have four major components:
    - Component A: Improvement of early warning dissemination system by strengthening the Last Mile Connectivity (LMC) of cyclone warnings and advisories.
    - Component B: Cyclone risk mitigation investments.
    - Component C: Technical assistance for hazard risk management and capacity building.

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    - Component D: Project management and institutional support.
- These components are highly interdependent and have to be implemented in a coherent manner.
- **I**ts **aim** is to undertake suitable structural and non-structural measures **to mitigate the effects of cyclones** in the coastal states and UTs of India.
- The NDMA had come up with its National Guidelines of Management of Cyclones in 2008.
- The basic premise of these guidelines is that the mitigation has to be multi-sectoral.

Challenges posing the Cyclone Management in India

- On an average, **five to six tropical cyclones form every year,** of which two or three could be severe.
- More cyclones occur in the Bay of Bengal than the Arabian Sea and the ratio is approximately 4:1. This is **now changing due to impact of climate change.**
- There is an over-emphasis on a total evacuee figure, particularly in states such as Odisha.
- There exists an inadequate focus on response aspects other than evacuation, such as measures to minimise crop damage, assistance for quick harvest, adequate relief and timely distribution of post-cyclone assistance such as for damaged houses, etc.

Way forward

Short term measures:

- Provide cyclone forecasting, tracking and warning systems
- Construction of cyclone shelters, cyclone resistant buildings, road links, bridges, canals, drains etc.
- Establishing Early Warning Dissemination System (EWDS), and Capacity building for coastal communities.
- Mock drills, and training of local population and police by NDRF and SDRF
- Plantations of strong rooted trees, canopies, mangroves and proper vegetation cover which act as first line of defence.
- Proper drainage system throughout the city to discharge the water as soon as possible to avoid flood like conditions
- Use of NAVIC and RESOURCESAT-2 for disseminating coastal information and helping in disaster management.
- Implementation of National Cyclone Risk Mitigation Project.

Long term measures:

- The **National Cyclone Risk Mitigation Project (NCRMP)** should be implemented with financial assistance from the World Bank
- The NDMA had come up with its **National Guidelines of Management of Cyclones in 2008.**
- The basic premise of these guidelines is that the mitigation has to be multi-sectoral.
- Developing **Integrated Coastal Zone Management (ICZM)** frameworks for addressing the sustainability and optimal utilisation of coastal resources as also cyclone impact minimisation plans.
- Ensuring **cyclone resistant design standards** are incorporated in the rural/ urban housing schemes in coastal areas
- Implementing **coastal flood zoning,** flood plain development and flood inundation management and regulatory plans.
- **Coastal bio-shields spread**, preservation and restoration/ regeneration plans.
- There is a need for private sector participation in designing and implementing policies, plans, and standards.
- Need of Disaster **Management program** to be inclusive including women, civil society, and academia.

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Conclusion

Cyclone Disaster Management encompasses mitigation and preparedness measures for cyclones. Installing disaster-resilient power infrastructure in the coastal districts, providing concrete houses to poor and vulnerable households, and creating massive community awareness campaigns are essential.

12. Landslides

A **landslide** is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "**mass wasting,"** which denotes any down-slope movement of soil and rock under the direct influence of gravity.

The impacts of the landslides are:

- Every year, landslides in the region kill dozens of people and cause widespread damage to several villages such that they have now become **almost unfit for habitation**.
- They create **blockades in the road network and river system**, which in turn, cause **floods**.
- The **terraced farm fields have been destroyed** that cannot be easily renovated or made productive again.
- The **road network remains closed for long periods** causing indescribable hardship to the villagers who get their basic supplies and provisions from the neighbouring areas.
- **Water sources are disrupted and choked by debris** from landslides.
- The **river sediment load is increased** considerably, causing irregular courses and frequent breaching of the banks- resulting into **unexpected floods**.
- The water channels are affected from the up hillside due to which the villagers are **devoid of water for irrigation purposes**. This **adversely affects agriculture production** in the region.

Measures undertaken to control landslides

- **National Landslide Risk Management Strategy** which addresses all the components of landslide disaster risk reduction and management was released in 2019.
- The **Geological Survey of India (GSI) has done a national landslide susceptibility Mapping** for 85% of the entire 4,20,000 square km landslide-prone area in the country.
- The **areas have been divided into different zones according to the propensity of the disaster.**
- Improvement in early warning systems, monitoring and susceptibility zoning can reduce the damage caused by landslides.
- **National Disaster Management Authority (NDMA) Guidelines on Landslide Hazard Management (2009):**
    - Delineating areas susceptible to landslide hazards
    - Encouraging implementation of successful landslide remediation and mitigation technologies.
    - Developing institutional capacity and training for geoscientists, engineers, and planners is necessary for the effective management of the landslide hazard.
- **National Institute of Disaster Management (NIDM),** a premier institute that provides Capacity Building support to various National and State level agencies in the field of Disaster Management & Disaster Risk Reduction has been set up.

Reasons why impact of landslides are still high despite the above measures

- Lack of correct data and poor data collection strategies.
- The CAG reported the lack of communication systems which aggravated the problems. For instance, during the Uttarakhand landslides
- The issue of coordination and administration at different levels is still lingering.
- **Poor predictability:** The appropriate interpretation of the meteorological forecast is still lacking.

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- Lack of awareness among the people.
- Faulty evacuation strategies in landslide-prone areas
- Limited resources & Financial constraints
- Use of obsolete technology for landslide management.
- The inappropriate hill area development including unscientific construction of roads, tunnels, hydroelectric projects do a lot of damage to the natural balance of the structures.
- Illegal encroachment of the rivers is still not contained through appropriate actions.
- Weak environmental impact assessment regime is in part responsible for increases problems.
- There is a lack of scientific analysis of landslide events and inventory of data analysis which makes mistakes recurring.

Way forward

Structural measures:

- Stopping Jhum cultivation.
- Store Excess water in catchments areas to reduce the fury of flash floods, recharge the ground water and improve the environment. Dig runoff collection ponds in the catchments.
- Grow fuel / fodder trees in all of the common lands.
- Plantation in barren areas, especially on slopes, with grass cover is an important component of integrated watershed management programme.
- Grazing should be restricted. The grasses of industrial importance should also be planted so that there is some economic return to the farmers as well.
- Use the surface vegetative cover to protect the land from raindrop's beating action, bind the soil particles and decrease the velocity of flowing water.
- Construction of engineering structures like buttress beams, retaining walls, geogids, nailings, anchors to stabilise the slopes.

Non-structural measures:

- Environmental Impact Assessment of the infrastructure projects before commencing the work.
- Declaration of **eco-sensitive zones** where mining and other industrial activities are banned. **Eco-tourism** should be promoted.
- **Hazard mapping** of the region to identify the most vulnerable zones and take measures to safeguard it.
- **Local Disaster Management** force for quick relief and safety of the people affected by landslides.
- Teaching people about landslides & ways to mitigate.
- Constructing a permanent assessment team comprising scientists & geologists for better mitigation and adaptation techniques.
- **Involving the local people** for sustainable development of Himalayas

Conclusion

Himalayas are of vital importance to India in terms of climate, monsoon, water source and a natural barrier safeguarding the peninsula. The **National Mission for Sustaining the Himalayan Ecosystem** under NAPCC is a step ahead to address a variety of issues Himalayas is facing today.

13. Forest Fires

Forest fires are considered as one of the most widespread hazards in a forested landscape. They have a serious threat to forest and its flora and fauna. Forest fires essentially are 'quasi-natural', which means that they are not entirely caused by natural reasons (like volcanoes, earthquakes and tropical storms), but are caused by human activities as well. In India's case, a combination of hot weather, oxygen and dry vegetation is a potent recipe for forest fires.

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Forest fires: A regular phenomenon in India

- Every year large areas of forests are affected by fires of varying intensity and extent.
- Since the start of 2021, there has been a series of forest fires in Himachal Pradesh, Nagaland-Manipur border, Odisha, Madhya Pradesh, and Gujarat, including in wildlife sanctuaries.
- At least 5,291 forest fires were recorded in Odisha between February 22 and March 1, 2021 — the highest in the country for the same period, according to FSI biennial report.
- Telangana recorded the second-highest fires in the country at 1,527 during the same period, followed by Madhya Pradesh (1,507) and Andhra Pradesh (1,292), according to FSI data.
- Around 95 percent of the forest fires in India are on account of human activity.
- Around 21 percent of the total forest cover is highly to extremely fire prone, adds the latest forest survey.
- Based on the forest inventory records, 40% of forests in India are exposed to occasional fires, 7.49% to moderately frequent fires and 2.405 to high incidence levels while 35.71% of India's forests have not yet been exposed to fires of any real significance.

Reasons for Increasing frequency of forest fires

- Forest fires can be caused by a number of natural causes, but officials say many major fires in India are triggered mainly by human activities.
- Emerging studies link climate change to rising instances of fires globally, especially the massive fires of the Amazon forests in Brazil and in Australia in the last two years.
- Fires of longer duration, increasing intensity, higher frequency and highly inflammable nature are all being linked to climate change.
- In India, forest fires are most commonly reported during March and April, when the ground has large quantities of dry wood, logs, dead leaves, stumps, dry grass and weeds that can make forests easily go up in flames if there is a trigger.
- Under natural circumstances, extreme heat and dryness, friction created by rubbing of branches with each other also have been known to initiate fire.
- In Uttarakhand, the lack of soil moisture too is being seen as a key factor.
- In two consecutive monsoon seasons (2019 and 2020), rainfall has been deficient by 18% and 20% of the seasonal average, respectively.

Measures to control forest fires

- **Forest fire line:** Successive Five-Year Plans have provided funds for forests fighting. During the British period, fire was prevented in the summer **through removal of forest litter** all along the forest boundary. This was called "Forest Fire Line".
    - This line used to prevent fire breaking into the forest from one compartment to another.
    - The collected litter was burnt in isolation.
- **Firebreaks**: Generally, the fire spreads only if there is continuous supply of fuel (Dry vegetation) along its path. The best way to control a forest fire is therefore, to prevent it from spreading, which can be done by creating firebreaks **in the shape of small clearings of ditches in the forests.**
- **F**orest Survey of India monitors forest fire events through satellites on two platforms**– MODIS and SNPP-VIIRS,** both in collaboration with the U.S. National Aeronautics and Space Administration (NASA) and Indian Space Research Organization (ISRO).
    - While the **SNPP-VIIRS** identifies, alerts and tracks fire incidents on real time data at 375X375 sq meter pixel, the older version MODIS detects it in the range of 1kmX1km.
    - Forest fire suppression relies very heavily on "dry" firefighting techniques because of poor water availability.
- **Integrated forest protection:** The main objective is to control forest fires and strengthen the forest protection. The works like Fireline clearing, **assistance to Joint Forest Management committees**, creating water bodies, purchase of vehicles and communication equipment, purchase of firefighting tools, etc., needs to be undertaken.

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- **Prevention of human-caused fires** through education and environmental modification. It will include silvicultural activities, engineering works, people participation, and education and enforcement. It is proposed that more emphasis be given to people participation through Joint Forest Fire Management for fire prevention.
- **Prompt detection** of fires through a well-coordinated network of observation points, efficient ground patrolling, and communication networks. Remote sensing technology is to be given due importance in fire detection. For successful fire management and administration, a National Fire Danger Rating System (NFDRS) and Fire Forecasting System are to be developed in the country.
- Introducing a forest fuel modification system at strategic points.
- **National Action Plan on Forest Fires (NAPFF):** It was launched in 2018 to minimize forest fires by informing, enabling and empowering forest fringe communities and incentivizing them to work with the State Forest Departments.

Conclusion

It is important to prevent the lungs of the nation from ravages of fire. With climate change and global warming on the rise, India must prevent human-made disaster to ensure our carbon sinks are protected.

14. Nuclear Disaster

Nuclear Energy plays a critical role in achieving sustainable economic and social development. Modern civilization heavily depends on energy for daily activities. Energy is like a lifeline for the sustenance and progress of the entire world. Nuclear energy plays a vital role in the world economy by generating jobs, income and facilitating trade on a massive scale.

Recently, a fire broke out near the Zaporizhzhia nuclear plant in Ukraine (Europe's largest) during the course of a military battle between Russia and Ukraine

Some nuclear disasters across globe:

- In 2011, multiple reactors at the Fukushima Daiichi nuclear plant suffered severe accidents after an earthquake and a tsunami.
- The Chernobyl disaster in Ukraine in 1986 is the worst nuclear power plant accident ever in terms of death toll and cost.
- The Kyshtym Nuclear disaster was a radiation contamination incident that occurred on 29 September 1957 at Mayak, a Nuclear fuel reprocessing plant in the Soviet Union. It measured as a Level 6 disaster on the INES, making it the third most serious Nuclear disaster ever recorded behind the Chernobyl Disaster and Fukushima Daiichi Disaster (both Level 7).

Potential of nuclear energy as a source of clean energy:

- **Thorium and Uranium reserves:** India has vast reserves of Thorium that can fuel India's nuclear energy provided appropriate technology. India's thorium deposits, estimated at 360,000 tonnes, and natural uranium deposits at 70,000 tonnes. The country's thorium reserves make up 25% of the global reserves.
- **Energy poverty:** The per capita consumption of electricity is very low at about 1,181 kWh per annum, about half of the world average and way below that of advanced countries. There exist shortages in energy and peak power in the range 10-15%.
- **Energy demand:** Nuclear energy is a critical part for India's future energy security. As we know India's annual energy demand is expected to rise to 800 GW by 2032, it is very important to consider every source of energy in the optimum energy mix.
- **Energy efficiency:** Quantities of nuclear fuel needed are considerably less than thermal power plants. For instance, 10000 MW generation by coal will need 30-35 million tons of coal, but nuclear fuel needed will be only 300-350 tons.

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- **Economic growth:** Rapid economic growth is also critical to achieve developmental objectives and poverty alleviation. A sustained economic growth of about 8 to 10% is needed over the next few decades. As electricity is a key driver for economic growth, it is necessary that there is a massive augmentation in electricity capacity, apart from transmissions and distribution systems.
- **Decrease in Energy Supply:** Energy supply has been negatively affected by changing weather patterns. As water reservoirs decreases due to lower precipitation and increased evaporation, capacity for electricity production from hydropower and other water-intensive generation technologies may decline.
- **Climate change:** Due to its emission-free nature, nuclear energy can contribute to global efforts under the Paris Agreement. India's Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) has outlined goals to reduce the carbon emissions intensity of its economy by 33-35% by 2030 as well as increase the clean energy electricity capacity to 40% of the total installed capacity in the same period.

Vulnerabilities of nuclear energy and nuclear reactors:

- In the case of Nuclear Reactors, there is a **concern over their safety**. The 2011 Fukushima Daiichi accident in Japan is a testimony to the havoc that can be created by a nuclear leak.
- A nuclear disaster might leave large swathes of land uninhabitable — as in Chernobyl — or require a prohibitively expensive clean-up — as in Fukushima, where the final costs may eventually exceed $600 billion.
- Nuclear power generation is not as clean as it is often considered. This is demonstrated in the case of Kudankulam. People have been protesting for decades as they worry that the hot water dispatched from the plant will affect the marine life of the surrounding water sources and subsequently their livelihood.
- Nuclear power plants are capital intensive and recent nuclear builds have suffered major cost overruns. An illustrative example is the V.C. Summer nuclear project in South Carolina (U.S.) where costs rose so sharply that the project was abandoned — after an expenditure of over $9 billion.
- Also, to build nuclear reactors, it requires huge amounts of land. This would displace local communities who may not want to leave. Further, it is not easy to rehabilitate them and provide them with appropriate compensation.
- Pursuant to this, the nuclear industry came to a standstill except in Russia, China and India. However, a revival was seen with global warming becoming ever more apparent.
- In 2020, a windstorm caused the **Duane Arnold nuclear plant** in the U.S. to cease operations. The frequency of such extreme weather events is likely to increase in the future.
- The commercial nuclear supply can lead to **proliferation of Nuclear weapons**. The fast breeder reactors have a risk of the turning of inert uranium to plutonium, and then using the plutonium as fuel. However, plutonium is a nuclear explosive which can be used for developing a bomb.
- The recent reports that China is building two more fast reactors have immediately provoked international concerns about China's possible weapons plutonium production.

Conclusion

Nuclear power can help to improve energy security. For a rapidly developing economy such as India, it can make a vitally important contribution to growth. Besides, nuclear power can also **reduce the impact of volatile fossil fuel prices and mitigate the effects of climate change**. India needs to come up with a durable energy strategy to meet present and future energy demands of its population and industries.

Chernobyl disaster:

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Russian troops had captured **the Chernobyl nuclear plant** in northern Ukraine, the site of one of the worst nuclear disasters in human history.

What is Chernobyl disaster?
The Chernobyl tragedy was the result of a nuclear accident on 26 April 1986 at reactor No. 4 at the Chernobyl Nuclear Power Plant, near the town of Pripyat in **the Ukrainian SSR (Ukrainian Soviet Socialist Republic).**

- There were nearly 8.4 million people exposed to radiation in the three nations.
- It occurred when a group of technicians in what was then Soviet-controlled Ukraine carried out a botched safety test that led to a series of explosions.
- It is said to have released 400 times more radiation than the atomic bomb that was dropped on Hiroshima in Japan.

15. Endosulfan victims case

The **Supreme Court** has slammed the Kerala government for State's inaction in providing relief to **the Endosulfan pesticide exposure victims.**

- This also amounts to **a breach of the apex court's 2017 judgment,** which had ordered the State to pay ₹5 lakh each to the victims in three months.

What is endosulfan?
It is a widely-banned pesticide with hazardous effects on human genetic and endocrine systems.

- It **does not occur naturally in the environment.**
- It is listed under **the Rotterdam Convention on the Prior Informed Consent.**
- Use of endosulfan is banned by **Stockholm Convention on Persistent Organic Pollutants.**

The Supreme Court in India has banned the manufacture, sale, use, and export of endosulfan throughout the country, citing its harmful health effects in 2011.

Uses:
Sprayed on crops like cotton, cashew, fruits, tea, paddy, tobacco etc. for control of pests in agriculture such as whiteflies, aphids, beetles, worms etc.

Effects on humans:

- This pesticide is a known **carcinogen, neurotoxin and genotoxin (damages DNA).**
- Endosulfan blocks the inhibitory receptors of the CNS, disrupts the ionic channels and destroys the integrity of the nerve cells.

Environmental effects:

- Endosulfan in the environment gets accumulated in food chains leading to higher doses causing problems.
- If Endosulfan is released to water, it is expected to absorb to the sediment and may bioconcentrate in aquatic organisms.

What is Kerala's case?
From the mid-70s, Kerala villages used aerial spraying of endosulfan on 4,600-ha. cashew nut plantation. Locals reportedly experienced illnesses, palsies and deformities.

16. Cluster bombs and thermobaric weapons

Russia had resorted to the use of dangerous **thermobaric bombs — or vacuum bombs —** in Ukraine.

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- Cluster weaponry has been banned by **the 2008 Convention on Cluster Munitions;** however, neither Ukraine nor Russia were signatories at the convention.

Thermobaric weapons:

These are called **vacuum bombs** as they **suck in oxygen from surrounding areas to generate high-voltage explosions.**

- The blast wave is of a greater intensity and duration than conventional bombs and can vapourise humans.
- While they cannot be used in taking down tanks and other such military vehicles, they can dismantle civilian spaces, like residential or commercial complexes.

Cluster bombs:

Cluster munitions are non-precision weapons that are designed to injure or kill human beings indiscriminately over a large area, and to destroy vehicles and infrastructure such as runways, railway or power transmission lines.

- They can be dropped from an aircraft or launched in a projectile that spins in flight, scattering many bomblets as it travels.
- Many of these bomblets end up not exploding, but continue to lie on the ground, often partially or fully hidden and difficult to locate and remove, posing a threat to the civilian population for long after the fighting has ceased.

Convention on Cluster Munitions:

It is **an international treaty** that prohibits all use, transfer, production, and stockpiling of cluster bombs, a type of explosive weapon which scatters submunitions ("bomblets") over an area.

- Additionally, the Convention establishes a framework to support victim assistance, clearance of contaminated sites, risk reduction education, and stockpile destruction.
- The convention was adopted on 30 May 2008 in Dublin.
- As of date, there are 110 state parties to the convention, and 13 other countries have signed up but are yet to ratify it.