Q.1What is your assessment of India's recent commitment to global efforts for combating climate change? Comment.

Approach - It expects you to write about climate change and assess the India recent commitment to global efforts for combating climate change.

Introduction

Climate change is the global phenomenon of climate transformation characterised by the changes in the usual climate of the planet (regarding temperature, precipitation, and wind) that are especially caused by human activities. As a result of unbalancing the weather of Earth, the sustainability of the planet's ecosystems is under threat, as well as the future of humankind and the stability of the global economy.

Body

India's recent commitments to global efforts for combating climate change:

1. Coalition in resilient future: India is also keen on fostering international cooperation to fight climate change. Prime Minister highlighted that India along with France set up the International Solar Alliance (ISA). ISA promotes and facilitates cooperation on solar among developing countries.
2. Infrastructure to prevent disaster: The Coalition for Disaster Resilient Infrastructure is an international organisation in the making. The coalition will work towards a common goal of establishing infrastructure which is resilient to pressures of climate change and environmental disasters. India has pledged INR 4.8 billion (Around USD 70 million) to the CDRI.
3. Paris agreement:Ratifying the Paris Agreement in 2016, India's pledge lays out a comprehensive approach to limit climate impacts while fostering economic growth. India is an emerging economic powerhouse. It is also the world's third-largest energy consumer and greenhouse gas (GHG) emitter where Indian efforts to fast track Paris commitments will clearly help in speeding global efforts due its size.
4. Sustainable Mobility:Increasing the fleet of electric vehicles and its charging infrastructure in India with FAME II will be key to improve air quality in cities, enhance energy security by reduced dependence on imported crude, and is also a key solution to fight climate change.
5. Innovative technologies: India is partnering 22 member countries and the European Union in the 'Mission Innovation' on clean energy, and is co-lead in smart grid, off-grid and sustainable biofuels innovation challenges.
6. Taking leadership: India is on track to meet its Copenhagen commitments. Such an effort will help India take leadership role in tackling climate change across the globe and thus ensuring fast-tracking of global efforts.
7. Renewable energy commitments: UN's Climate Week in New York this past September, India's Prime Minister committed to a target of 450 gigawatts (GW) of renewable energy installations, likely by 2030equivalent to five times more than India's current installed renewable capacity (82.6

GW) and bigger than the size of India's electricity grid size in 2019 (362 GW).

Assessment of India's commitments to combat climate change:

- Per capita, India's emission from fossil fuels (in 2017) is by far the lowest among major economies at 1.83 MT carbon dioxide (CO_2). Despite its low per capita emissions, India has made significant commitments in its Intended Nationally Determined Contribution (NDC). However, to meet our Paris commitments and fully implement our NDCs in a timely manner, India requires Conclusion enhanced new and additional financial, technological and capacity building support, which has been missing on the global front.
- The Green India Mission, which seeks to work towards the target is woefully underfunded and has been regularly missing its annual targets. This has rendered the fulfilment of the 2030 pledge hard if not altogether unlikely.
- India's third NDC commitment is to create an additional carbon sink of 2.5 to 3 billion tons of carbon dioxide equivalent through additional forest and tree cover by 2030. However, the progress has been limited and the country has more work to do on this target.
- In its second Biennial Update Report submitted to the UNFCCC in 2019, India claimed to have reduced the emission intensity of its economy by 21 per cent by 2014. But it didn't specify emissions data for 2005 or the GDP data series used to arrive at the conclusion.
- Among the Group of 20 (G-20) countries, which are some of the biggest GHG emitters, only India and the UK rank among high performers. In fact, eight of the G-20 countries rank among low performers. This clearly shows that individual performance can't bring about much change in global discourse.
- The Climate Action Tracker website has rated India's climate efforts as "2-degree compatible" — that can contribute to limiting warming by the end of the century to 2° Celsius; making India the only major economy to be so highly rated. This showcases the global significance of Indian efforts.

Conclusion

Climate change strategy needs to focus on supporting design of policies and action plans, promoting early adaptation as well as long-term strategies like directing investment towards low carbon technologies and practices and finally integrating climate change broadly into development assistance at the global, regional and national levels.

Q.2. Examine the problem of groundwater contamination in India's agrarian states. What are the possible ways to address this challenge? Discuss.

Approach - It expects students to write about ground water contamination problem in India's agrarian states. And also highlight few possible way to address the challenge of ground water contamination problem.

Introduction

Groundwater contamination occurs when man-made products such as gasoline, oil, road salts and chemicals get into the groundwater and cause it to become unsafe and unfit for human use.Materials from the land's surface can move through the soil and end up in the groundwater. For example, pesticides and fertiliserscan find their way into groundwater supplies over time as seen in India's many agrarian states.

Body

Problem of Ground water contamination in Indian agrarian states:

1. DDT, BHC, carbamate, Endosulfan, etc. are the most common pesticides used in India. But, the vulnerability of groundwater to pesticide and fertiliser pollution is governed by soil texture, pattern of fertiliser and pesticide use, their degradation products, and total organic matter in the soil.
2. A recent study conducted by the Water Resources Ministry and a comparative analysis of the data done by The Tribune, reveals that while Haryana is on the top with regard to overall contamination of underground water, Punjab has the highest quantity of Nitrate, Cadmium and Chromium (heavy metals) among the region's states.
3. Indiscriminate extraction of groundwater for irrigation purposes has led to inland salinity problem in parts of Punjab, Haryana. Uranium contamination has aggravated by groundwater-table decline. Decline in groundwater table induces oxidation conditions. As a result, uranium enrichment in shallow groundwater is enhanced.
4. A recent survey undertaken by Centre for Science and Environment from eight places in Gujarat, Andhra Pradesh and Haryana reported traces of heavy metals such as lead, cadmium, zinc and mercury. Shallow aquifer in Ludhiana city, the only source of its drinking water, is polluted by a stream which receives effluents from 1300 industries.
5. Arsenic contamination is by far the biggest mass poisoning case in the world putting 20 million people from West Bengal.
6. There are no estimates of the public health consequences of groundwater pollution as it involves methodological complexities and logistical problems. Pesticide are toxic or carcinogenic. Generally, pesticides damage the liver and nervous system. Tumour formation in liver has also been reported.

Issues in Tackling Groundwater Contamination and Pollution in agrarian states:

- Lack of data and information: The step towards evolving measures to prevent and cure groundwater quality deterioration is generating reliable and

accurate information through water quality monitoring (WQM) to understand the actual source/cause, type and level of contamination. However, there are a few observation stations in the country that cover all the essential parameters for water quality and hence the data obtained are not decisive on the water quality status.

- Costly water technologies: WQM involve expensive and sophisticated equipments that are difficult to operate and maintain and require substantial expertise in collecting, analysing and managing data. Since water technology is still not advanced in India, it is very likely that the available data is less reliable.
- Inadequate methods: The existing methodology for WQM is inadequate to identify the various sources of pollution. Integration of data on water quality with data on water supplies, which is very important from the point of view of assessing water availability for meeting various social, economic and environmental objectives, is hardly done.
- Varying results: In the absence of any stringent norms on water quality testing, results can change across agencies depending on sampling procedure, time of testing, and testing instruments and procedure.

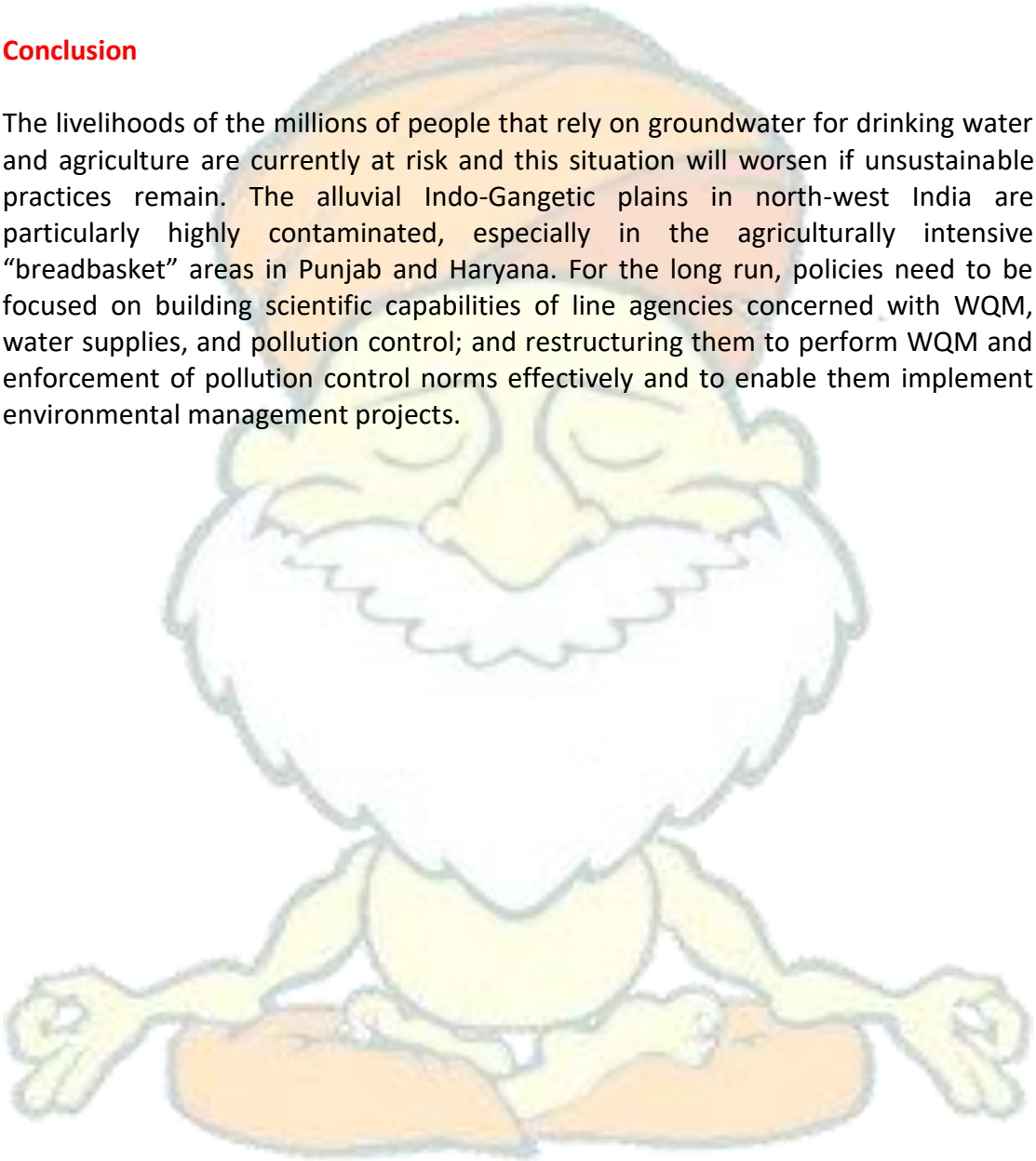
Possible ways to address thisground water contamination challenges:

1. Bioremediation: Bioremediation of an aquifer contaminated with organic compounds can be accomplished by the biodegradation of those contaminants and result in the complete mineralization of constituents to carbon dioxide, water, inorganic salts, and cell mass, in the case of aerobic metabolism; or to methane, carbon dioxide.
2. Recharging water table: Artificial recharge could push seawater-freshwater interface seawards. These techniques can also be used to reduce the levels of fluoride, arsenic or salinity in aquifer waters on the principle of dilution.
3. In situ treatment: In Indian context, it is not economically viable to clean aquifers. In the case of arsenic, methods for in situ treatment have already been in used. In situ- valent, iron permeable reactive barriers (PRBs) are used in situ to remove chromium and several chlorinated solvents in groundwater and are tested successful for removing arsenic.
4. Reverse Osmosis (RO): It is a process to get rid of all the impurities in drinking water including deadly ions and organisms and pesticide/fertiliser residues. RO systems are suitable for removing several of the toxic substances present in water in dissolved form, including fluoride, fertiliser and pesticide residues, and heavy metals.
5. A coagulation system: Household arsenic treatment method is the ferric chloride coagulation system. This involves precipitation of arsenic by adding a packet of coagulant in 25 litres of tube well water, and subsequent filtration of the water through a sand filter.
6. Community Aquifer Management:A more practical consideration was to use groundwater associations as agents in monitoring and enforcement of government policies and laws. The idea of groundwater organisations has a wide appeal; it was advocated to India by a British Geological Survey study.

7. Research in water resource: Information Systems and Resource Planning through establishing appropriate systems for groundwater monitoring on a regular basis and undertaking systematic and scientific research on the occurrence, use and ways of augmenting and managing the resource
8. Water user associations (WUAs): By emphasising on local-level institutions like the WUAs, the Atal BhujalYojana has signalled the Jal Shakti ministry's inclination towards such persuasive solutions.

Conclusion

The livelihoods of the millions of people that rely on groundwater for drinking water and agriculture are currently at risk and this situation will worsen if unsustainable practices remain. The alluvial Indo-Gangetic plains in north-west India are particularly highly contaminated, especially in the agriculturally intensive "breadbasket" areas in Punjab and Haryana. For the long run, policies need to be focused on building scientific capabilities of line agencies concerned with WQM, water supplies, and pollution control; and restructuring them to perform WQM and enforcement of pollution control norms effectively and to enable them implement environmental management projects.



3. What are the key principles and objectives of environmental impact assessment (EIA)? Illustrate with the help of suitable examples.

Approach:

It is straightforward question where it expects students to write about - in first part write about main Principles of Environment Impact Assessment (EIA) - in second part write about various objectives of Environmental Impact Assessment.

Introduction:

Environmental Impact Assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. Environment Impact Assessment in India is statutorily backed by the Environment Protection Act, 1986 which contains various provisions on EIA methodology and process.

Body:

Main Principles of Environment Impact Assessment (EIA):
There are eight guiding principles that govern the entire EIA process: The principles of EIA:

- Participation: The process should provide appropriate opportunities to inform and involve the interested and affected publics, and their inputs and concerns should be addressed explicitly in the documentation and decision making. Appropriate/timely access for interested parties is important.
- Transparency: The process should have clear, easily understood requirements for EIA content, ensure public access to the information, identify the factors that are taken into account in decision making and acknowledge limitations and difficulties. Open and accessible assessment decisions are important in EIA.
- Efficient: The Process should impose the minimum cost burdens in terms of time and finance on proponents and participants consistent with meeting accepted requirements and objectives of EIA.
- Accountability: The decision maker should inform decision making and result in appropriate levels of environmental protection and community well-being. Decision makers should be responsible for their actions and decisions.
- Credibility: The process should be carried out with professionalism, rigour, fairness, objectivity, impartiality and balance and be subject to independent checks and verification.
- Cost-effective: The process should achieve the objectives of EIA within the limits of available information, time, resources and methodology.
- Integrated: The process should address the interrelationships of social, economic and biophysical aspects.
- Practicality: The process should result in information and outputs which assist with problem solving and are acceptable to and able to be implemented by

proponents. Information/outputs readily usable in decision making and planning is important.

Objectives of Environmental Impact Assessment:

- To make sure that environmental considerations are explicitly addressed and incorporated into the development decision making process.
- To forestall and avoid, reduce or offset the adverse significant biophysical, social and other relevant effects of development proposals.
- To shield the productivity and capacity of natural systems and the ecological processes which maintain their functions.
- To encourage development that is sustainable and optimizes resource use and management opportunities.

Examples:

- For river valley project like Narmada river valley project
- EIA of mineral mines in Odisha

Conclusion:

There is a need to strengthen the implementation of EIA, Independent EIA Authority is required for fair and objective decisions. There is also a need for centralised data bank for storing information and the transparency must be maintained in dissemination of all information related to projects from notification to clearance to local communities and general public.

4. What are the most potent ecological hazards in the coastal regions? Examine.

Approach:

It is straightforward question, here it expects aspirants to - start answer by defining term like ecological hazard - in main body part you need to write about various ecological hazards in coastal region and how they are impacting surrounding region.

Introduction:

An ecological hazard is a substance, state or event which has the potential to threaten the surrounding natural environment or adversely affect people's health, including pollution and natural disasters such as storms and earthquakes.

Body:

Some of the hazards include movement of barrier islands, sea level rise, hurricanes, nor'easters, earthquakes, flooding, erosion, pollution and human development along the coast.

- Movement of barrier islands: They create a barrier between the mainland and the ocean. They shelter and protect the mainland from the powerful forces of wind, waves, tides, currents and the ravages of storms and hurricanes. They shelter the estuaries that form behind the barriers. Between 75% and 95% of all marine species are dependent upon these estuaries at some point in their lives. They allow marshes to build up in the quiet waters of the sound. The marshes filter the pollutants that come in from mainland rivers and when the marsh grasses die they create detritus, a valuable food source for small marine organisms. Barrier islands provide valuable habitats for mammals, shellfish and fish including many endangered species, and offer a greater variety of bird species than any other ecosystem in the continental United States. They also serve aesthetic purposes and for years, have inspired artists, poets, writers, bird watchers, boaters, picnickers, sunbathers and swimmers.
- Sea level rise: Landward recession or erosion of sandy shorelines. Depending on the rate and scale of sea level rise, the environmental, social and economic consequences or shoreline recession within low lying inter-tidal areas, in particular, may be significant in the medium to long term. Salt water intrusion and landward advance of tidal limits within estuaries. This may have significant implications in the medium to long term for freshwater and salt water ecosystems and development margins, particularly building structures and foundation systems within close proximity to the shoreline. Existing coastal gravity drainage, storm water infrastructure and sewerage systems may become compromised over time as mean sea level rises. Sea level rise will influence the entrance opening regimes for intermittently closed and open lakes and lagoons and alter catchment flood behaviour over time.
- Pollution: Coastal and estuarine ecosystems have been, and still are, heavily influenced by humans through pollution and habitat loss worldwide. Over 80% of all marine pollution originates from land-based sources which are primarily

industrial, agricultural and urban. Pollution accompanies most kinds of human activities, including offshore oil and gas production and marine oil transportation. Besides altering the marine environment, pollution also causes economic losses

- Human development along the coast: Living organisms play an essential role in biogeochemical cycles through coastal systems. They are themselves vulnerable to rapid changes which take place in the coastal zone due to anthropogenic activities, but changes in the structure of populations of organisms will in turn affect the geochemistry of the habitat, to a point where such cycles might become dysfunctional. The consequences of such changes taking place in coastal ecosystems may have consequences at global level leading to an unbalance in fluxes of energy and minerals at the interface between land and sea.

Conclusion:

Solution of these issues lies in more informed preparedness for coastal flooding, tsunami inundation or maritime conditions through timely and accurate forecasts, improved approaches for managing shoreline erosion, accurate estimates of extreme event magnitudes for coastal engineering design, through to long-term planning for the impacts of coastal hazards and sea-level rise on low-lying coastal margins

5. What are the post disaster management strategies for combating the impact of earthquakes? Discuss.

Approach:

As the directive here is discuss it is necessary to cover various angles of the topic. In the first part of main body part explain earthquake and its impact. In the next half of main body part tell the post disaster management strategies to combat the impact of earthquakes. You can conclude by explaining the significance of these strategies to combat earthquake and other natural hazards.

Introduction:

An earthquake is shaking of the earth caused due to the release of energy from the earth's interior, which generates waves that travel in all directions. Minor tremors caused by small vibrations occur every few minutes but great earthquakes happen because of faulting (Normal, reverse and strike-slip) cause a great number of disruptions.

Body:

Earthquake is characterized by suddenness, scale, and magnitude. These three characters make it extremely dangerous when it comes to life and property without any discrimination. Following are the impacts of the earthquakes:

- Damage to property: The upheaval caused by an earthquake does huge damage to the property. Especially in a developed area of high population density, the damage to the property is huge.
- Human loss: Within the period between 1990 and 2006, around 23,000 lives were lost because of major earthquakes in India.
- One of the important impacts of the earthquake is the change in the river course due to blockage.
- Earthquakes in the ocean basin creates huge waves that strike on the coast and create huge damages. The 2004 Tsunami in Sumatra brought Tsunami to the east coast of India.
- Mud fountains: Due to the huge impact of the earthquake, mud and hot water may emerge on the surface. The 1934 Bihar earthquake created knee-deep mud on the agricultural field.
- If the earthquake happens in areas of dams, reservoirs, the damage is multiplied. Earthquake in hilly and mountain areas may cause landslides and avalanches.
- Earthquakes cause damage to electric property and gas pipes. Due to the havoc caused by the earthquake, it is even difficult to contain the fire.

Post disaster management strategies to combat the impact of earthquakes: Disaster management, goes through different stages.

- Post disaster management strategy deals with 5R's i.e. Relief, Response, Rehabilitation, Reconstruction and Recovery.

- Post-disaster initiatives taken in response to a disaster with a purpose to achieve early recovery and rehabilitation of affected victims and communities.
- The relief phase includes providing the immediate relief in terms food, medical attention, temporary shelter. It is the prime most post disaster strategy to mitigate the negative impact of earthquake.
- The response phase includes the search and rescue; fulfilling basic humanitarian needs of victims; assistance by regional, national and international bodies etc.
- Considering no possibility to reconstruct the area if damage is so grave, the rehabilitation phase comes in to picture. It includes rehabilitating the affected people at an alternate site. Besides it also includes making provisions for the livelihood of people.
- During reconstruction, the location or construction material of the property is considered.
- Recovery phase starts after the immediate threat to human life has subsided. The immediate goal of the recovery phase is to bring the affected area back to some degree of normalcy.
- Considering these strategies in mind Disaster management act, 2005 envisaged the creation of 'National Disaster Management Authority (NDMA)', headed by the Prime Minister to implement activities of Disaster Management in India. Besides State Disaster Management Authorities (SDMAs) headed by respective Chief Ministers to do the same at the state level.
- Besides, the government launched two Mobile apps, the first one is 'India Quake'– Developed by the National centre for seismology, the mobile app disseminates real-time earthquake information and the second one is 'Sagar Vani'-Intended to serve coastal communities, the mobile app disseminates ocean related information and alerts to the user community in a timely manner for their safety.
- The National Disaster Response Force (NDRF) strives to be the first responder at heritage sites, which are vulnerable to disasters such as earthquakes, floods, cyclones, and tsunami across India.
- In Earthquake management scenario in India, The NDMA guidelines of 2007 on earthquake preparedness are very important.
- Apart from it, India is a signatory to the Sendai Framework for Disaster Risk Reduction which works in disaster management in a very holistic way. India also works closely with the United Nations International Strategy for Disaster Reduction (UNISDR).
- At the international forum India has also took one step ahead to deal with such issues through the initiative of Coalition for Disaster Resilient Infrastructure (CDRI).

Conclusion:

The UN Office for Disaster Risk Reduction (UNDRR) recently published its report titled "The Human Cost of Disasters". It enlists Earthquake as one of the highly

dangerous disaster for human lives and its subsequent impact on economy. Hence, it becomes of critical importance that apart from focussing on post mitigation measures if we focus on pre-disaster strategies then it will have less impact on the lives of people and its subsequent economic impact.