

Approach – Answer: General Studies Mains Mock Test 1233 (2019)

1. *Discussing the reasons behind disappearance of springs, examine how springshed management can help revive springs, especially in the Himalayan region.*

Approach:

- Briefly mention about the importance of springs.
- State the reasons behind disappearance of springs.
- Examine how springshed management can help revive springs especially in the Himalayan region.

Answer:

A spring is a place where water from beneath the ground naturally flows out to the surface. Springs are the main source of water for millions of people for drinking, domestic, and irrigation purposes, especially in hilly regions. Despite the key role that they play, springs have not received their due attention and many are drying up.

Reasons behind disappearance of springs:

- Increased water demand
- Seismic activity
- Land use change including infrastructural development.
- Ecological degradation, including deforestation and soil erosion
- Climate change and rising temperatures are leading to: rise in rainfall intensity and reduction in its temporal spread
- Marked decline in winter rain.

A government report has found that nearly 60% of Himalayan low water springs have dried up, have reached critical levels or have become seasonal. Further, water quality is also deteriorating due to improper sanitation.

Springshed management to revive springs:

Springshed is the unit of land where rain falls (recharge area), and then emerges at discharge point, the spring. As recharge area of a spring in one watershed, may as well lie in an adjoining watershed, springshed is a better unit for spring revival programmes.

Springshed management includes various aspects of water management, ranging from hydrology to governance of natural resources. Apart from conducting scientific tests, systematic mapping of springs and taking up appropriate engineering solutions to enhance recharge, it also addresses the demand side challenges by augmenting the efficiency of water use. This involves capacity building, awareness and education of communities regarding spring water management.

It links the livelihoods of communities with interventions related to revival of springs. Such management programmes are participatory, involving local communities, NGOs, Civil Society Organisations and implemented through a science-based management approach. For e.g. *DharaVikas* programme by Sikkim government.

2. Highlight the importance of iron and steel industry as the basic building block of the economy. In this context, discuss the key features of the National Steel Policy, 2017.

Approach:

- Discuss the importance of the iron and steel industry for the economy.
- Mention the key features of National Steel Policy 2017.

Answer:

Iron and steel industry is the bedrock of infrastructure and manufacturing sectors and is strategically important. Owing to its multiple forward and backward linkages, it is a booster for economic growth. Further, projects like Make in India and Smart City mission have led to a dramatic growth in the domestic consumption of steel. More than 50% production of steel is done by small producers thereby giving employment to a large number of people. Thus demand and supply side developments unfolding in India and worldwide require enhanced policy measures.

Key Features of National Steel Policy 2017

- Create self-sufficiency in steel production by providing policy support & guidance to private manufacturers, MSME steel producers, CPSEs.
- Acquire a global competitive edge by focusing on quality of production.
- Focus on input supply chain by targeting domestic availability of natural gas, iron ore and coking coal without compromising on cost efficiency.
- Acquire overseas resources keeping in mind the limited domestic raw material.
- Enhance the domestic steel demand.
- Facilitate foreign investment

It sets ambitious targets of building 30 mT capacity of crude steel by 2031, to reduce import dependence on coking coal to 50% by 2030-31 and becoming net exporter of steel by 2025-26. To achieve this target India must promote steel intensive structures like Housing for all, roads and railway infrastructure, shipbuilding and automobiles. Also, the auction of mines, washeries, and palletization plants should be made transparent to ensure the supply of raw material.

3. Giving a brief account of rising nitrogen emissions in India, discuss why it is a matter of concern. What steps can be taken to limit such emissions?

Approach:

- Briefly discuss rising nitrogen emissions in India.
- Discuss the implications.
- Suggest solutions.

Answer:

As per the Indian Nitrogen Assessment report published by Society for Conservation of Nature, Indian NO_x emissions grew at **52% from 1991 to 2001 and 69% from 2001 to 2011**. Agricultural soils contributed to over 70% of nitrous oxide (N₂O) emissions, followed by waste water (12%) and residential and commercial activities (6%).

Causes:

- Burning of fossil fuels, waste from power plants, industries, domestic and commercial activities.
- Nitrogen based agricultural fertilisers, cattle emissions, crop burning.

- Waste water and sewage.

According to another recent study undertaken by Green Peace, out of the **50 nitrogen hotspots** in the world, three are located in India, including:

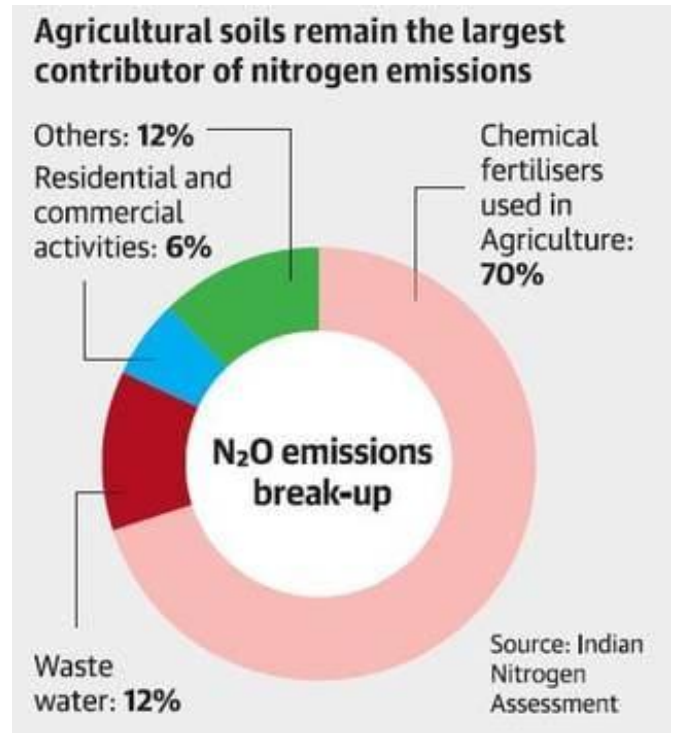
- Delhi-NCR,
- An area that falls in both Sonbhadra in UP and Singrauli in MP and
- Talcher-Angul in Odisha.

Implications on health, ecology and livelihoods:

- Public health hazards due to degrading air quality and respiratory problems
- Impact on ecosystems, natural vegetation, and biodiversity of the planet
- Acidification of soil and water- impacts food and water security of the country
- Ozone depletion
- Environmental problems like **red tides** and **dead zones**

Potential solutions

- **Reducing NO_x pollution from Agriculture-**
 - Promoting optimal use of fertilizers and making precision farming affordable.
 - Innovations like neem coated urea, nitrification inhibitors for fertilizers etc.
 - Cultivating legume rich crops to reduce dependency on nitrogen based fertilisers.
 - Disincentivizing crop residue burning.
 - Nutrient recovery/recycling from waste water for agriculture.
 - Rationalising fertiliser subsidy
- Addressing weak emission regulation for power plants/vehicles.
- Promoting renewable energy and enhancing energy efficiency.
- Augmenting the air quality monitoring network across the country and strengthening the awareness and capacity building activities. NCAP (National Clean Air Programme) is a step in this direction.



4. **What is Strategic Environmental Assessment (SEA)? Draw a comparison between Environmental Impact Assessment (EIA) and SEA.**

Approach:

- Explain what is Strategic Environmental Assessment.
- Bring out its comparison with Environmental Impact Assessment.

Answer:

Strategic Environmental Assessment (SEA) is the Environmental Impact Assessment (EIA) of policies, plans and programmes, keeping in mind that the process of evaluating environmental impacts at a strategic level, is not necessarily the same as that at a project level.

SEAs can recommend changes within the proposed plans or programmes, improvements in coordination between relevant agencies, new cross-sectoral interventions and suggestions for EIAs of future projects and improve their quality

Comparison between EIA and SEA

EIA	SEA
It is usually reactive to a development proposal as it is applied at a relatively later stage of decision making.	It is pro-active and informs development proposals..
It assesses the effect of a proposed development on the environment.	It assesses the effect of a policy, plan or programme on the environment, or the effect of the environment on development needs and opportunities.
It addresses a specific project.	It addresses areas, regions or sectors of development.
It assesses direct impacts and benefits.	It assesses cumulative impacts and identifies implications and issues for sustainable development.
It focuses on the mitigation of negative impacts and enhancement of positive impacts.	It focuses on maintaining a chosen level of environmental quality.
It involves narrow perspective and a high level of detail.	It involves wide perspective and a low level of detail.
It focuses on project-specific impacts.	It creates a framework against which impacts and benefits can be measured.

These are both complementary to each other and work in tandem for environment protection, biodiversity conservation and responsible development.

5. *Montreal Protocol is often considered as the most successful international environmental treaty. Highlighting the achievements of the protocol, discuss the reasons for its success.*

Approach:

- Start with very briefly explaining the Montreal Protocol.
- Mention the achievements of the Protocol.
- Discuss the reasons for its success and lessons for other treaties.

Answer:

Montreal Protocol, is an international treaty, adopted in Montreal on Sept. 16, 1987, that aimed to regulate the production and use of chemicals that contribute to the depletion of Earth's ozone layer.

Achievements of the Protocol

- Led to decrease in the atmospheric abundance of controlled ozone-depleting substances (ODSs) and start of the recovery of stratospheric ozone.
- The atmospheric abundances of both total tropospheric chlorine and total tropospheric bromine from long-lived ODSs have been declining since the 2014 Assessment.
- Outside the Polar Regions, upper stratospheric ozone layer has recovered at a rate of 1-3% per decade since 2000.
- Due to Montreal Protocol, a much more severe ozone depletion in the Polar Regions has been avoided.

Reasons for the success of the Protocol

- **Approach of Cooperation:** Much negotiation was held in small, informal groups. leading to a genuine exchange of views amongst credible people.

- **Principles based:** the “precautionary principle” and the concept of **common, but differentiated, responsibility** took root in the **Montreal Protocol** when developing countries were given longer time to phase-out ODS.
- **Flexibility to accommodate newer information:** The protocol could be amended to include stricter controls i.e. more ozone-depleting substances were added to the control list and ensure total phase-out, rather than partial phase-out, called for.
- **Trade Provisions and restrictions:** These limited the supplies of CFCs and other ozone-depleting substances (ODS) to non-signatories countries which forced them to ratify the Protocol.
- **Clear List of Targeted Sectors:** Clear articulation of chemicals and sectors allowed governments prioritise the main sectors early.
- **Incentive to Industry:** The Montreal Protocol also provided a stable framework that allowed industry to plan long-term research and innovation.
- **Institutional Support:** The expert, independent Technology and Economic Assessment Panel (and its predecessors) helped signatories reach solid and timely decisions on often-complex matters.
- **Compliance Procedure:** It prioritised helping wayward countries back into compliance. If necessary, resources from the **Multilateral Fund** are available for some short-term projects

On the other hand, these features are generally absent in other environmental treaties which has reflected in their lack of desirable performance.

6. Analyse the phenomenon of 'Resource Curse', by giving adequate examples from around the world as well as India.

Approach:

- Introduce by explaining the meaning of 'curse of resources'.
- Discuss in brief the impact of the above.
- Give appropriate examples wherever necessary.
- Conclude by giving a way forward.

Answer:

The 'curse of resources' is a paradoxical situation in which countries with an abundance of non-renewable natural resources experience stagnant economic growth or even economic contraction. It is also known as the "paradox of plenty." This is particularly the case with oil producing countries like Venezuela. Reasons such as the manner in which resource income is spent, system of government, institutional quality, early vs. late industrialization etc. all have been used to explain this.

Impact of 'curse of resources':

- **Dutch disease:** Increase in the economic development of a specific sector (ex- natural resources) and a decline in other sectors.
- **Revenue volatility:** This is because prices of natural resources are subject to wide fluctuation.
- **Enclave effects:** Economic diversification may be delayed or neglected by the authorities in the light of the temporarily high profits from a specific sector.
- **Crowding out of human capital:** Short term gains from natural resource sector may tend to neglect education because they see no immediate need for it.
- **Violence and conflict:** Vulnerability to conflicts increases due to undermining of the quality of governance and economic performance. Ex- Iraq's invasions of Iran and Kuwait; Libya's repeated incursions into Chad, etc.

Examples from India:

States like Orissa, Jharkhand and Chhattisgarh are rich in productive minerals. These three states together account for 70 per cent of India's coal reserves, 80 percent of high-grade iron ore, 60 percent of bauxite and almost all the chromites reserves. They are also rich in forest reserves.

Over dependence on mining has not allowed the development of agriculture and other sectors in these states. Further, the benefits of resource extraction fails to reach all the sections of society, promotes corruption and illegal regulations. Also, these regions continue to bear the brunt of Left Wing Extremism.

However, these regions have high prospects for future developments. With the efforts like bringing positive institutional change, capacity building, international cooperation to curb corruption, economic diversification, enhancing social cohesion, etc. can bring a positive change in these regions.

7. *Discuss the reasons behind increased instances of human-wildlife conflict and suggest some mitigation measures to address them.*

Approach:

- Provide a brief introduction mentioning the rising tide of human-wildlife conflict.
- Highlight the root causes of the problem.
- List effective and creative mitigation measures to address them.

Answer:

Human-wildlife conflict is one of the main threats to the survival of many species and is also a significant threat to local human populations. In recent times, the frequency of human-wildlife conflict has increased in India which led to the loss of animal and human life.

Root causes of the problem

- **Unplanned development and urbanization**
 - Extension of linear infrastructural projects (power transmission lines) in forest areas.
 - Unplanned settlements near the forest and wildlife reserves.
 - Dislocation or disrupting the wildlife corridor, by increasing the density of road network (**national and state highways**) in wildlife areas.
- **Forest land diversion for**
 - Non-forest purposes like mining, road and developmental projects.
 - **Agricultural expansion** up to forest boundaries leading to habitat loss for the wildlife.
- **Wildlife conservation projects**
 - Successful implementation led to an increase in the animal population.
 - However, the reduced availability of natural prey base leads to wild animals seeking alternate sources.
- **Human population explosion** and shrinking forests have created competition for limited resources.

Effective and creative mitigation measures

- Effective implementation of The National Wildlife Action Plan (2017-2031) which calls for making people an intrinsic part of the process to check rising human-animal conflict.

- Learning from best practices: Chhattisgarh and Jharkhand have developed apps that can track the population of elephants in the region which can be adopted by other states.
- Develop forest fringes; Prevent and control unnecessary human intervention in the wildlife area
 - Restore or rebuild the wildlife corridor to enable the wildlife animal's free movement.
 - Resettle the human habitation from the vicinity of the wildlife area.
 - Strengthen vigilance to prevent and control poaching thereby ensuring sufficient prey base within the wildlife area.
- Set up permanently manned rescue units at state level and create rescue centres for problematic animals.

8. ***Elaborate on the concept of rat-hole mining. In the context of North-Eastern India, highlight its ecological consequences. Also, explain why it still persists despite the ban imposed by National Green Tribunal (NGT)?***

Approach:

- Explain the concept of rat-hole mining, its types and ecological impacts.
- Highlight the NGT ban, its reasons and reasons for its persistence.

Answer:

Rat-hole mining is a primitive and hazardous method of mining for coal, where workers use tunnels that are only 3-4 feet in diameter (hence, rat-hole) to enter and extract coal. There are two types of rat-holes:

- when dug into the ground these are vertical shafts leading to the mines where horizontal tunnels are dug;
- the second type is where horizontal holes are dug directly in the hillsides to reach coal seams (bed of coal).

It is highly prevalent in the North-East Indian state of Meghalaya.

Ecological consequences

- **Water from streams** and rivers such as Kopili in the mining area has become acidic and unfit for drinking and irrigation, and is toxic to plants and animals.
- Entire roadsides in and around mining areas are used for **piling of coal** which is a major source of **air, water and soil pollution**.
- **Off road movement of trucks** and other vehicles in the area causes further damage to the ecology of the area.
- In Jaintia hills district of Meghalaya, **deforestation, soil erosion, surface run-off, caving in of the ground** are some other prominent environmental problems associated with coal mining.

In light of the above facts, NGT imposed ban on rat-hole mining in 2014 on grounds of it being unscientific and unsafe for workers, as evidenced by the 15 trapped workers in a flooded coal mine in Meghalaya, where all are feared dead. Still, **it persists due to the following reasons:**

- **Lack of other economically viable method** for coal extraction in these areas as the coal seam is extremely thin.
- Rat-hole mining is a locally developed technique with a long history of it being practiced by family members of the nearby tribals, thereby providing jobs to the locals. Also, there are **lack of other employment opportunities** in the region.
- Prevalence of **mining mafia** in the region in collusion with the political elites.

- **Misuse** of this **6th Schedule** of Indian Constitution wherein private individuals having private interests in earning monetary benefits from minerals vested under the land are engaging in coal mining and are attempting to legitimize this act by claiming immunity through tribal autonomy over land ownership.

The NGT has found the Meghalaya Mines and Mineral Policy, 2012 inadequate as it does not address rat-hole mining and instead states: "Small and traditional system of mining by local people in their own land shall not be unnecessarily disturbed." So, there's an urgent need to put in place a new policy that lays down rules for safe mining practices and is rigorously enforced.

9. *Growth of natural capital is vital for sustainable economic development in India. In this context, state the concept, strategy and broad policy guidelines for Natural Capital Accounting (NCA) for effective management of natural resources.*

Approach:

- Briefly mention what is natural capital.
- Discuss the concept, strategy and broad policy guideline for NCA.
- Mention how it helps in balancing economy and environment.

Answer:

Natural Capital is defined as the stock of natural assets which include geology, soil, air, water and all living things. It is from this natural capital that humans derive a wide range of services, often called ecosystem services, which make human life possible.

Akin to financial capital, when we draw down too much stock from our natural environment, we run up a debt which needs to be paid back, for example by replanting clear-cut forests, recycling waste etc. Therefore, it is important to have Natural Capital Accounting.

Natural Capital Accounting- Concept

Natural capital accounting (NCA) is a process of quantifying those natural capital stocks and service flows to determine their nature and variation over a period of time. It helps in assessing that whether the management and use of available natural capital has been sustainable or not. By aligning NCA with conventional economic accounts, it helps in exploring the relationship between the environment and the economy.

- India is participating in the **Natural Capital Accounting and Valuation of Ecosystem Services Project** supported by UN Statistics Division, UNEP, CBD and funded by EU.

Strategy

- It aims to gather information on the contribution of ecosystem goods and services generated by various ecosystems to the wider economy.
- It incorporates natural capital into national accounts for better decision making as it provides detailed statistics for better management of economy like accounts for sectoral inputs of water, energy etc.

Policy guidelines

- Development of a national plan and selection of ecosystem accounts, in physical and monetary terms, based on national priorities.
- Development of guidelines and methodology that contribute to the national implementation of the project and the global research agenda in the context of SEEA EEA (System of Environmental Economic Accounting Experimental Ecosystem Accounting).

- Development of a set of indicators in the context of the 2030 Sustainable Development Agenda, Aichi Targets and other international initiatives.
- Contributions to the alignment between SEEA and corporate sustainability reporting.
- Enhanced capacity building and knowledge sharing as a way to enlarge the community of practitioners on natural capital accounting.

Thus, this strategy will help in balancing **economic growth** and **environmental protection**. It will help India design a management strategy that maximizes the contribution to economic growth while balancing tradeoffs among other ecosystem services like flood protection, groundwater recharge etc.

10. Discuss the factors responsible for location of high-tech industries in the vicinity of major metropolitan regions.

Approach:

- Brief introduction about the factors responsible for location of Industries especially hi-tech industries in general.
- Explain why most of the Hi-tech industries are located nearby metropolitan centres.

Answer:

Industrial locations are driven by variety of factors which pull the industry to a particular place. Some of the major factors influencing location include – land, labour, capital, market, power, transport, raw Materials etc.

The hi-tech industries employ advanced technology and are strongly involved in the process of innovation. High technology is the latest generation manufacturing where professionals or white-collar workers do extensive R & D to produce high class product with efficiency.

Reasons why hi-tech industries are located in vicinity of metropolitan regions :

- **Skilled labour:** Though large area is not required for high tech plants, it requires presence of skilled white collar workers who are readily available in metropolis and surrounding regions. Further, Metropolitan people are relatively more educated and they can learn these technologies faster.
- **Market:** Metropolitan areas consist of densely populated urban population which acts as ready market for the hi-tech industry.
- **Infrastructure:** Various amenities such as transportation, power, ICT facilities, availability of office space etc. are available near city locations.
- **Leisure facilities:** Vicinity regions of metropolitan areas offer excellent leisure facilities like natural parks, golf courses etc.
- **Government support:** in terms of built industrial estates or technology parks on the edge of towns and cities , taxation incentives etc.

In metropolitan areas also, the industries specifically choose peripheral locations as it offers space for future expansion, affordable land rents, proximity to other hi-tech firms and a pleasant working environment with a lot of greenfield sites.

11. Analyse how far the 'Katowice Climate Package' goes in achieving the objectives of the Paris Climate agreement amid the concerns of developing countries like India.

Approach:

- Elaborate the provisions in Katowice Climate Package that show the plans to operationalise the climate change regime contained in the Paris Agreement.

- Mentions the concerns of developing countries and otherwise as well.
- Present a future course of action vis-à-vis these concerns.

Answer:

The Paris Agreement aims to keep a global average temperature rise this century well below 2 degrees Celsius and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius above pre-industrial levels. In view of this, nearly 200 countries agreed to a set of guidelines to implement the 2015 Paris Agreement on climate change at the 2018 United Nations Climate Change Conference (COP 24) in Katowice, Poland.

The rules achieve the objective of Paris agreement in following ways:

- **Instil discipline regarding INDCs:** The Enhanced transparency framework (ETF) will be operationalised to monitor, verify and report actions taken as per the NDCs of countries. It will ensure stocktaking of progress on the Paris Agreement.
- **Obligation for developed countries:** The Paris Agreement contained a general obligation for developed countries to report biennially on their provision and mobilisation of climate finance. The rules identify 15 specific pieces of information that states should submit including “projected levels of public financial resources to be provided to developing countries”.
- **Infuse accountability and compliance:** The rules permit a compliance committee to consider cases where countries have breached binding procedural obligations. Thus, if a state does not submit a contribution every five years or a developed country does not submit its report on provision of finance, the committee will step in.

However, there are concerns amid the developing countries such as India regarding some developments at COP24:

- **Substantial rollback of differentiation between the global North and South in climate action:** Even though it started with Paris Agreement through voluntary commitments for all, COP 24 went further, with uniform standards of reporting, monitoring and evaluation for all countries. While flexibility in reporting requirements are given to all developing nations, the concession has been hedged in with a number of conditions, with the intention of forcing them to full compliance.
- **Issue of climate financing:** The developing world argues that the bulk of climate finance must be from public sources. However, as the “rulebook” stands today, private sector flows or loans, which will increase the indebtedness of developing countries, are to be considered adequate fulfilment of developed country obligations under the UNFCCC.
- **Disregard of equity:** Funds for finance, better terms for new technologies to be transferred to developing and vulnerable countries, and economic and non-economic support for loss and damage and their equitable moorings in the text have been eliminated, minimised or footnoted.
- **Postponed certain key issues:** The details on funding, building capacity and work on decisions on market mechanisms will be continued at the upcoming negotiations i.e. at COP 25 in Chile. The final text of the agreement also lacks specific 2030 greenhouse gas emission reduction targets.

Addressing these concerns is of paramount importance for a successful climate change regime. Therefore, COP 25 in Chile must include an outcome resolving these issues and building a future which is ecologically sustainable, economically viable and socially equitable.

12. Highlight the factors responsible for location of automobile industries in India. Also, examine the challenges in the wake of transformations taking place in the automotive industry.

Approach:

- Enumerate the locational factors of automobile industry in India.
- Mention the challenges faced by the automotive industry in the wake of turbulent transformations.

Answer:

The state of Auto Industry in a country is an indicator of economic growth in real term because a healthy and growing automobile sector indicates overall industrial economy, good roads, rising income and employment etc. The **location factors for setting up automobile industries in India include:**

- **Proximity to markets:** It guarantees a steady supply of merchandise to clients and lessens the cost of transportation. For eg. Maruti plant in Gurgaon in lieu of the Delhi-NCR market.
- **Supply of raw materials:** For eg. Ahmedabad-Vadodara industrial region has many factories for spare parts, car-accessories, tires, circuit, glasses etc. from which they can easily outsource their parts of the automobile.
- **Transportation facilities:** It guarantees opportune supply of raw materials to the organization and completed products to the clients. For eg. presence of Delhi-Mumbai Industrial corridor (DMIC) enables easy transport of spare parts, raw material and finished cars in the Delhi-NCR and Mumbai manufacturing regions.
- **Infrastructure availability:** The essential framework offices like power, water and waste transfer, and so forth. This is also a reason for many automobile manufacturing hubs such as Chennai auto manufacturing hub to be in and around urban areas.
- **Labour and Wages:** For example, Tata Nano plant in Sanand in Ahmedabad district has a large population and urban amenities, so there's no need to setup special township for workers and their families as there's already a huge availability of labour.
- **Capital:** The capital structure of an area as well as the finance availability with the manufacturer assumes a significant part in getting the consideration of the maker.
- **Government policies:** The arrangements of the state governments and nearby bodies concerning work laws, construction laws, wellbeing, and so on. For eg. Haryana government (Manesar hub) has focused on building local infrastructure, and also gives incentives like tax holidays, and a 10 per cent refund of land cost on timely completion of projects.
- **Supporting/Ancillary industries:** It is important as procurement of segment parts is being increasingly outsourced. For example, Mumbai-Pune-Ahmedabad region has multiple such ancillary industries relating to tyre manufacturing, steel manufacturing, crude oil import etc.

Challenges in view of rapid transformations taking place in the automotive industry:

- The fundamental technological paradigm relies on, **volume production**, it has become progressively more unprofitable in the face of increasingly segmented niche markets.
- **Need to adhere to the quick policy changes**, means that the bulk production has to be vary of any standard requirement **eg. Rapid changes in the Bharat Stage Emission Standards.**
- **Increasing regulatory and social pressures** to improve both the sustainability of its products and methods of production.
- **Shift towards self-driven cars** and hybrid cars which require companies to spend more on research.
- **Overhauling of purchasing process:** For example, Tesla is selling its vehicles directly to consumers rather than the dealerships, which has been the norm till now.
- **Interpretation of data:** According to Accenture, modern cars collect around 25gb of data per hour from various inbuilt sensors and cameras. This data has the potential for real-time insights to be drawn about performance, speed, condition of components and much more.
- **Slowing down** of pace of growth in unit sales in mature markets and shift in consumer demand and demographics.

India, the second-largest automobiles market with close to 25 million units, has young population; low-cost manpower and dominance in digital technology to its advantage to become a world leader in the future.

- 13. Examine the factors responsible for causing soil pollution in India. Discussing its impact on various ecosystem services, suggest some remedial measures to restore polluted soil.**

Approach:

- Briefly explain soil pollution.
- Examine the factors responsible for causing soil pollution in India.
- Discuss the impact of soil pollution on various ecosystem services.
- Suggest some remedial measures.

Answer:

Soil pollution refers to the presence in the soil of chemicals or substances out of place or present at a higher than normal concentration that has adverse effects on any non-targeted organism.

The main factors responsible for soil pollution in India are

- **Anthropogenic factors**
 - the chemicals used in or produced as byproducts of industrial activities
 - domestic and absence of proper disposal mechanism for the same,
 - livestock and municipal wastes (including wastewater),
 - agrochemicals, pharmaceutical waste, biological pollutants and petroleum-derived products.
 - Chemicals released to the environment accidentally, for example from leaks, oil spills or leaching from landfills, or intentionally, like the use of fertilizers and pesticides, irrigation with untreated wastewater.
 - Soil pollutants resulting from atmospheric deposition from smelting, transportation, spray drift from pesticide applications and incomplete combustion of many substances.
- **Natural Factors**
 - Natural Soil pollution caused due to events such as forest fires.
 - The natural processes may also have an influence on the human released toxic chemicals into the soil, overall decreasing or increasing the pollutant toxicity and/or the level of contamination of the soil.

Impact on various ecosystem services

- Soil pollution affects food security by reducing crop yields due to toxic levels of contaminants and by causing crops produced from polluted soils to be unsafe for consumption by animals and humans.
- Many contaminants are transported from the soil to surface waters and ground water causing great environmental harm through eutrophication and direct human health issues due to polluted drinking water.
- Pollutants also directly harm soil microorganisms and larger soil-dwelling organisms and hence affect soil biodiversity and the services provided by the affected organisms.

Remedial measures

Soil Remediation techniques can be divided in two main groups: in situ (on the site) and ex-situ (removal of contaminated soil for treatment off the site) remediation. Available remediation options include:

- **Physical remediation:** it includes techniques like vapour extraction, air sparging, washing/pump and treat, electro-remediation and particle sorting.
- **Chemical remediation:** it includes techniques like oxidation, reduction, hydrolysis, dichlorination and pH manipulation
- **Biological treatments:** it includes techniques like microbial activity, landfarming, bio-piling, composting, bioreactor, bioleaching and phytodegradation

Also, strong regulatory programs to minimize soil contamination need to be introduced. The government also needs to regulate its policies on fertilizers to prevent agricultural soil pollution. In addition, reducing the volume of refuse or waste in landfills by recycling materials such as plastics and various other materials can be an effective check against soil pollution.

14. What is Conservation Agriculture? Highlight the prospects and challenges of adopting Conservation Agriculture in India. Also, mention some important policy considerations for its promotion.

Approach:

- In the first part, explain the concept of conservation agriculture briefly.
- Divide the second part into prospects and challenges.
- In the last part, write the elements of policy need to promote conservation agriculture.

Answer:

Conservation agriculture is a practice of agriculture which aims at raising production and enhancing natural resource base simultaneously. It employs crop residue management techniques and diversified cover crops to increase natural organic matter in the soil.

Prospects of Conservation agriculture:

- It can enhance the agricultural yield vis-à-vis traditional methods, thus contributing to food security.
- It can solve the perennial problems of soil erosion, salinization and soil organic matter decline.
- It can help tackle water scarcity by reducing surface water evaporation..
- It can drastically reduce the input cost as it relies on zero till technology
- It can replace crop burning and help mitigate the Greenhouse Gas emission
- It can create opportunities of crop diversification in temporal and spatial patterns, thus enhancing natural ecological processes

However, conservation agriculture also faces certain challenges:

- **Extensive networking:** It requires the partnership and cooperation among farmers, scientists, extension workers and other stakeholders.
- **Understanding the system:** It is much more complex than conventional systems in terms of understanding of basic processes and component interactions.
- **Technological challenges:** These challenges relate to development, standardization and adoption of farm machinery for seeding with minimum soil disturbance, developing crop harvesting and management systems.
- **Site specificity:** Adapting strategies for conservation agriculture systems is highly site specific in a set of situations and not effective in another set.
- **Long-term research perspective:** Conservation agriculture practices, e.g. no-tillage and surface-maintained crop residues result in resource improvement only gradually, and benefits come about only with time. It has a long gestation period.

To promote the conservation agriculture, the state should intervene with appropriate policy initiatives like:

- Government should shift focus from food security to livelihood security and promote crop diversification through policies of tax, tariff, pricing, trade and reforms.
- Need to empower private players who are developing new agricultural technology and fuse a partnership among public, private corporations and farmers.
- Need of farmer participatory research which can fulfil the need of new machines, crops and other inputs suitable to micro environment.
- Need to accelerate building a knowledge base for sustainable resource management.
- An institutional structure should be created to execute training, extension support, programme implementation and market regulation.
- Local communities should be supported to promote the adaptation of conservation agriculture.

15. Delineate various regions which have high potential for hydro-electricity generation in India. Discuss the impact of hydroelectric projects on the environment.

Approach:

- Start with the potential of hydro-electric energy in India and their distribution.
- Discuss the positive impact of hydro-electric energy on environment.
- Also discuss some of the negative impacts of these energy plants.

Answer:

India is blessed with immense hydro-electric power potential and ranks 5th in terms of exploitable hydro-potential on global scenario. As per assessment made by CEA, India is endowed with economically exploitable hydro-power potential to the tune of 1,48,700 MW of installed capacity, as compared to the installed capacity of mere 48,974 MW (as of April 2017).

Basin/Rivers Potential Capacity (MW)

• Indus Basin	33,832 MW
• Ganga Basin	20,711 MW
• Central Indian River system	4,152 MW
• Western Flowing Rivers of southern India	9,430 MW
• Eastern Flowing Rivers of southern India	14,511 MW
• Brahmaputra Basin	66,065 MW
• Total	1,48,701 MW

The North-Eastern India has the maximum potential and may be called as the “Power House of India”.

Impact on environment:

Not only is it a renewable source of energy due to the continuously revitalised water cycle, but it also acts as a clean source of energy. There is no emission of air pollutants and toxic byproducts. However, there are concerns raised by hydroelectric projects:

- **Reservoir ecosystem** replaces river ecosystem which alter the temperature, oxygen composition, silt and chemical composition etc. This system generally houses invasive species which results in elimination of native species.

- Operating a hydroelectric power plant may also change **the water temperature and the river's flow** affecting native plants and animals in the river and on land. For eg: habitat fragmentation due to dams may lead to obstruction in fish migration.
- Downstream, **river is deprived of its siltload** which is very essential for regeneration and maintenance of deltas, flood plains, mangroves etc. This effects biodiversity in all these areas.
- There are further concerns being raised regarding **reservoir induced seismicity**.
- Reservoirs and water logging leads to **submergence of huge quantity of flora** which under water **releases methane gas**.
- The **construction** of dams etc. involves vibrations of the machines as well as noise pollution affecting the **wildlife** in the area.

Hydroelectric Projects can cause several problems, even though they burn no fuel. No doubt hydro-power projects have made important contributions but such developments had significant impacts on local livelihood and the environment. It is essential that local issues are taken into consideration.

16. Elaborate the concept, objectives and distribution of Petroleum, Chemicals and Petrochemical Investment Regions (PCPIRs) in India. Also, examine why the PCPIRs have failed to achieve the desired success.

Approach:

- Introduce by defining PCPIRs.
- Mention the objectivess and distribution of PCPIRs.
- Discuss reasons for their lack of desired progress.

Answer:

PCPIR Policy, introduced in 2007 provides for a specifically delineated investment region with an area of around 250 square kilometers planned for the establishment of manufacturing facilities for domestic and export led production in petroleum, chemicals & petrochemicals, along-with associated services and infrastructure.

These are infrastructure driven, cluster-based projects wherein the Government of India provides support for development of external physical infrastructure linkages e.g. rail, road, port, airport, telecom through Viability Gap Funding (VGF).

Objectives of PCPIRs Policy

- To **promote investment** and make the country an important hub for both domestic and international markets.
- To **boost** manufacturing, augmentation of exports and generation of employment.
- To provide the benefits of co-siting, networking and greater efficiency through the use of **common infrastructure and support services** in the sector.
- To provide a **competitive environment** conducive for setting up businesses.

Distribution of PCPIRs

- **Dahej PCPIR:** It is located at Dahej, Bharuch near Gulf of Khambhat, Gujarat strategic location of - rail, roads, sea and air- connectivity. It is also identified as a node for the proposed Delhi-Mumbai Industrial Corridor (DMIC).

- **Andhra Pradesh PCPIR- Vishakhapatnam:** AP PCPIR is a specifically delineated investment region with an area of around 603 square kilometers which was setup for export led production.
- **Paradeep PCPIR:** It is located in Odisha with 284.15 sq.km area. It is also located at the strategic location.
- **Tamil Nadu PCPIR:** It has developed area of 318 sq.km along the coastal Cuddalore — Nagapattinam stretch.

Evaluation of the Policy

- The industry feels that the anchor tenant in PCPIR is not sparing feedstock for downstream units and they are converting the available polymers into bulk polymers.
- Land acquisition has been a hindrance as well since the minimum land size acquisition norm is of 250 sq.km. In this context, the govt. is planning to reduce it to 50 sq.km.
- There are issues in ensuring coordination between the Central and State governments as well.
- Lastly, the investments in this sector have not picked up as envisaged. There is a need to attract more investments from foreign as well as domestic players in infrastructure facilities in the PCPIRs.

India's long coastline and large refining capacity can complement the growth of the PCPIRs. Addressing the above shortcomings can be a game changer for the petroleum sector.

17. What is seabed mining and why is it important for India? Highlight the environmental challenges associated with seabed mining and discuss how these can be addressed.

Approach:

- Explain the term seabed mining.
- Explain its importance for India.
- Highlight the environmental challenges associated with it.
- Discuss how these challenges can be dealt with.

Answer:

Seabed Mining (SBM) is an experimental industrial field which involves extracting submerged minerals and deposits from the sea floor. It is a relatively new retrieval process. These deposits are mined using either hydraulic pumps or bucket systems that take the ore to the surface to be processed.

Recently, International Seabed Authority (ISA) has licensed India to explore poly-metallic sulphides in the Indian Ocean Region. Over the next decade, the Indian government plans to pump in more than \$1 billion to develop and test deep sea technologies like underwater crawling machines and human-piloted submarines.

Seabed mining is significant for India as:

- Polymetallic nodules comprising copper, nickel, cobalt, manganese, iron and rare earth elements are used in making modern gadgets, from smartphones and laptops to pacemakers, hybrid cars and solar panels. There is an expanding global demand for these resources.
- The alternate availability of several non-energy materials will bring down their international prices. It will be beneficial for emerging economies like India where demand is high.
- It is one of the fastest businesses in contemporary time for which India should be ready.
- India is most interested in copper, nickel and cobalt, as they provide for clean power generation.

- India's goal is to become self-reliant in minerals. Currently India is dependent on China, so they have a strategic importance.

According to a 2017 study by Britain's National Oceanography Centre, mining experiments at seven sites in the Pacific Ocean showed that the amount and diversity of marine life was reduced "often severely and for a long time". The environmental challenges associated with sea-bed mining are:

- It could cause irreversible damage to a little understood ecology.
- Mining would bring sediment plumes and disturbance caused by mining could wipe out habitats for slow-growing corals and fish.
- Introduction of light to dark habitat will change the behavioural and breeding patterns of benthic communities. Undersea noise will disturb their movement/migration pattern.
- It could also have long-term effects on how the ocean, which absorbs carbon dioxide and heat, regulates the world's climate.
- The current regulatory mechanism i.e. U.N. Convention on the Law of the Sea (UNCLOS) is not sufficient to address environmental concerns
- Mining will also require site closure, which will restrict the movement of species both at deep and shallow sea.
- Waste water released during processing of ores may affect temperature and salinity of oceans and can also add sediments and heavy metals to it.

Above mentioned challenges can be dealt in the following ways:

- Intensive surveying of the sea floor and testing environmental impacts before launching large scale projects.
- Scooping up the mineral nodules, rather than digging up would have a lesser impact on the flora and fauna of the sea floor.
- A strong set of domestic laws, model regulations and accountability mechanism must be created.
- A separate provision for biodiversity conservation agreement in UNCLOS should be included and a new body to protect deep sea biodiversity in the international waters should be established.
- The countries should put their vested interests aside in agreeing to the new International Seabed Authority framework.

There is an urgent need for a new international consultation mechanism for the sustainable exploitation of resources in the high seas because at present only 2-7% of the Ocean and only 1% of the High Seas are protected. The proposed BBNJ (Biodiversity Beyond National Jurisdiction) Treaty and UN High Seas Treaty are positive steps in this direction.

- 18. *National Policy on Biofuels 2018 primarily tries to address supply-side issues that have discouraged the production of biofuels within the country. Elaborate. What other benefits are expected from the policy?***

Approach:

- Briefly, write about the objectives of National Policy on Biofuels 2018.
- Discuss how it address supply-side issues that discourage production of biofuels in India.
- Enumerate the other expected benefits from the policy.

Answer:

In India, production of biofuels holds economic, environmental and strategic importance. The National Policy on Biofuels, 2018 aims to ensure adequate and sustained supply of raw materials, increase in farmer's income, import reduction, employment generation and waste to wealth creation. The policy has made elaborate provisions to ensure an adequate supply of raw materials as:

- The policy expands the scope of raw material by including damaged food grains like wheat, broken rice - for production of ethanol.
- After approval of the National Biofuel Coordination Committee, surplus food grain can be used for ethanol production.
- Encouraging setting up of supply chain mechanisms for biodiesel production from non-edible oilseeds, used cooking oil, short gestation crops.
- Use of sugarcane juice, sugar-containing materials like sugar beet, sweet sorghum, starch-containing materials like corn, cassava as a biofuel feedstock.

Other expected benefits

- **Reduced import dependency** – By expanding the scope of raw material, ethanol production and blending with petrol can supplement crude import.
- **Cleaner environment** – Conversion of agricultural residue/wastes to biofuels instead of burning will reduce the emission of greenhouse gases.
- **Health Benefits** – By allowing the use of used cooked oil for ethanol production, people are incentivized not to use it for further preparation of food.
- **Municipal Solid Waste Management** – Technological development and efficient waste collection can ensure conversion of waste/plastic into biofuel.
- **Infrastructural Investment in Rural Areas** – Public and private investment in biorefineries will further spur infrastructural development in far-flung areas.
- **Employment Generation** – ethanol production plant operations and raw material supply chain management will create numerous job opportunities.
- **Additional Income to Farmers** – By selling agricultural residue and food grain surplus, farmers can earn extra income.

19. ***Explain how the Indian Forests Act, 1927 forms the backbone of governance framework of forests in India. Examine the need for its comprehensive amendment in light of rights based approach to governance.***

Approach:

- Introduce the answer by briefly explaining the origin and scope of the act.
- Give the reasons for why the act forms the backbone for governance of forest.
- Discuss the loopholes in the current law and examine the need for amendment in light of rights-based approach to governance.

Answer:

The Indian Forest Act, 1927 (IFA) is of colonial origin whereby the common law principle of eminent domain was given due importance. This principle was used to extend the scope of authority of the State

over forest lands, and the concept of private property brought exclusive use and alienability to these lands.

It forms the **backbone of governance framework of forests in India** as:

- Derived from the Indian Forest Act of 1878, this Act was implemented to consolidate and reserve areas having forest cover, or significant wildlife to regulate movement and transit of forest produce, as well as levy duty on timber and other forest produce.
- It defines the procedure to be followed for declaring an area to be a Reserved Forest, a protected forest or a village forest.
- It defines: what is a forest offence, what are the acts prohibited inside a reserved forest, and penalties leviable on violation of the provisions of the Act.

The historical context in which the provisions of IFA developed, and the context in which they are sought to be enforced today, are very different. Many reports like the MB Shah Report, 2010 and the TSR Subramanian report of 2015, have discussed the necessity of amending IFA in light of rights-based approach to governance. The **need for a comprehensive amendment of IFA from rights based perspective** arises as:

- There is no definition of forest in any Indian law pertaining to forest or its governance. According to the 1996 Supreme Court order, the dictionary definition of the word forest is taken to be the legal definition too.
- The legal definition of 'forest' will have huge ramifications on the conservation of forests as well as implementation of the Scheduled tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
- The main objectives of the Act have focussed upon reservation of forest for objective use with little focus on forest conservation. So far, any participative community forest development exercise is taking place outside the precincts of the rigid IFA in this regard.
- The provisions of IFA, like the amount of fines prescribed for violating the law, were set according to that time, are very low for today.
- Several laws concerning forest governance have been implemented since 1927; the conflicts that exist with respect to these laws and the IFA need to be addressed.
- With concerns of climate change, provisions relating to carbon sequestering, ecological services etc. needs to be incorporated.

Currently there lies a glaring gap between 'conservation' and 'legislation' with a world over change in the approach to biodiversity conservation; the amendment to IFA is the need of the hour.

20. Identify the major Uranium reserves in the world and the countries from where India sources it. What measures are required to ensure supply security of fuel for nuclear plants in the country?

Approach:

- Identify the major uranium reserves in the world
- Mention the countries from where India sources its Uranium
- Provide measures which are required to ensure supply-security of nuclear fuel in india

Answer:

Uranium is one of the atomic minerals contributing to natural terrestrial radioactivity. Uranium reserves are reserves of recoverable uranium, regardless of its isotopes.

Major Uranium reserves in the world:

- Australia has almost 1/3rd (largest) Uranium reserves of the world. Most of Uranium is concentrated in the Olympic dam in Northern Territory and Ranger mines in Southern Australia. Kazakhstan is among the world's largest Uranium producer with significant deposition in Chu-Sarysu basin, Syrdarya basin and Akmola region.
- Russia has Uranium deposits in Trans-Ural district, South-Eastern Siberia and Trans-Baikal region.
- Canada is the second largest producer of Uranium with high grade deposits largely concentrated in the Athabasca Basin of Northern Saskatchewan province. The McArthur River mine is the world's biggest uranium producing mine.
- Further South Africa, Niger, Brazil, China, Namibia, Mongolia, Uzbekistan, and Ukraine also possess around 2% or more of world's uranium reserves.

In India, Uranium is extracted mainly from Singhbhum, Jharkhand (Jadugoda, Banduhurang). Low grade Uranium is also found in Cuddapah basin, Bhima basin, South-West Khasi Hills and North-Delhi fold belt. The largest source of uranium is the monazite sands which occur in some places in Bihar and on east and west coasts with the largest concentration on the Kerala coast.

However due to quality issues, less availability, high cost of extraction and resistance faced by locals, India has to import its major Uranium requirements from Kazakhstan, Russia, Canada and Australia.

In recent times, France and Namibia are facing resistance from other countries as India is not a member of NSG and with Uzbekistan transportation issues are getting surfaced. According to the Department of Atomic Energy, a stockpile of 15,000 tonnes of uranium is required for achieving supply-security of fuel for nuclear plants in the country. Therefore, following measures should be taken in view of these challenges:

- Creating strategic Uranium Reserves. and conducting survey for new Uranium mines.
- Reducing extraction cost from deep underground mines through technological breakthrough.
- Diversifying nuclear trade with countries which are providers of reactors, fuel or other allied nuclear infrastructure such as Nigeria and Iran.
- Creation of enrichment facilities to process Uranium in intermediate forms.
- Effective lobbying at Uranium club and NSG.
- Creation of a national energy supply risk assessment and management framework.

Overall, nuclear energy is a good option for India to promote low carbon growth and for overall energy security. Therefore, along with these measure, India must also try to refine the technology which uses indigenous Thorium in order to ensure long term availability of fuel for nuclear plants.

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