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## GENERAL STUDIES (TEST CODE : 1701)

Name of Candidate	Simrandeep Singh	Registration Number	633402
Medium Eng./Hindi	English	Date	22/11/2020
Center	Online		

### INDEX TABLE

Q. No.	Maximum Marks	Marks Obtained
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
11	15	
12	15	
13	15	
14	15	
15	15	
16	15	
17	15	
18	15	
19	15	
20	15	

Total Marks Obtained:

Remarks:

### INSTRUCTIONS

- Do furnish the appropriate details in the answer sheet (viz. Name, Registration Number and Test Code).  
उत्तर पुस्तिका में सूचनाएं भरना आवश्यक है (नाम, प्रश्न-पत्र कोड, विद्यार्थी क्रमांक आदि)।
- There are **TWENTY** questions printed in **ENGLISH & HINDI** इसमें बीस प्रश्न हैं अंग्रेजी और हिन्दी में छपे हैं।
- All questions are compulsory.**  
सभी प्रश्न अनिवार्य हैं।
- The number of marks carried by a question/part is indicated against it.  
प्रत्येक प्रश्न/भाग के अंक उसके सामने दिए गए हैं।
- Answers must be written in the medium authorized in the Admission Certificate, which must be stated clearly on the cover of this Question-Cum-Answer (QCA) Booklet in the space provided. No marks will be given for answers written in medium other than the authorized one.  
प्रश्नों के उत्तर उसी माध्यम में लिखे जाने चाहिए जिसका उल्लेख आपके प्रवेश पत्र में किया गया है और उस माध्यम का स्पष्ट उल्लेख प्रश्न-सह-उत्तर (क्यूसीए) पुस्तिका के मुख्य पृष्ठ पर अंकित निर्दिष्ट स्थान पर किया जाना चाहिए। उल्लिखित माध्यम के अतिरिक्त अन्य किसी माध्यम में लिए गए उत्तर पर कोई अंक नहीं मिलेंगे।
- Word limit in questions, if specified, should be adhered to.  
प्रश्नों में शब्द सीमा, जहाँ विनिर्दिष्ट है, का अनुसरण किया जाना चाहिए।
- Any page or portion of the page left blank in the Question-Cum-Answer Booklet must be clearly struck off.  
उत्तर पुस्तिका में खाली छोड़ा हुआ पृष्ठ या उसके अंश को स्पष्ट रूप से काटा जाना चाहिए।

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## EVALUATION INDICATORS

1. Contextual Competence
2. Content Competence
3. Language Competence
4. Introduction Competence
5. Structure - Presentation Competence
6. Conclusion Competence

Overall Macro Comments / feedback / suggestions on Answer Booklet:

1.

2.

3.

4.

5.

6.

All the Best

1. Explain the concept of volcanic winter giving examples.

Volcanic winter refers to the drop in global temperatures as a result of volcanic explosion.

## Phenomenon of Volcanic winter

1. Volcanic eruptions spew out various gases like sulphur dioxide ( $\text{SO}_2$ ), and a lot of ash particles in addition to the molten lava.
2. These gases spread in the stratosphere, leading to reduced insolation.
3. The ash particles/aerosols also absorb the ~~reflected~~ radiated heat from the earth's surface, further reducing the temperatures.
4. Moreover the aerosols act as a perfect condensation nuclei, resulting in cumulonimbus clouds of high density. This further reduces the

insolation and a further drop in global temperatures.

## Effects of Volcanic winter

1. Many species become extinct. The disappearance of dinosaurs is also believed to be due to volcanic winter.
2. Sulphur dioxide emitted from volcanoes combines with water to precipitate as acid rain, thus damaging the life form on earth.
3. The nutrition cycles of the earth get unbalanced.
4. Ocean acidification also is observed, which adversely affects the marine life.

2. Bring out the importance of community based disaster management in India.

India has witnessed a number of local disasters in the past decades like landslides, urban flooding, droughts, avalanche, etc. Community based disaster management provides an important tool to cope with such disasters.

## Importance of Community based DM

1. Local expertise - The local people have varying skill sets that can be helpful in speedy rescue operations.
2. Resource deployment - In a scenario when the affected area is cut off from rest of the country, resources available locally can be utilised.
3. Decentralised planning helps in local needs based disaster specific planning which is more effective.

4. Community participation makes the whole process more inclusive.
5. Vulnerability reduction and risk mitigation strategies are more effective when community is involved.

Thus, it is important to look into community participation in disaster management, when climate related disasters are expected to increase in 21st century.

This has also been emphasised in the Sendai Framework (2015-2030) for disaster risk reduction.

3. The concept of ecological footprint is a useful indicator for assessing progress on the sustainable use of resources in a country. Explain.

Ecological footprint refers to the amount of terrestrial or aquatic resources needed to sustain the current human activities and also handle the waste generated by them.

## Ecological footprint as an indicator

It is usually expressed in hectares of land required for a population to be sustained. It acts as an indicator for sustainable use of resources as below:-

1. Provides easy correlation between available resources and current level of consumption.
2. Helps compare resource efficiency among different economies, thus helping in better planning.

3. Provides a tool to measure inter-generational equity in resource utilisation.
4. An ecological footprint exceeding the country's present resources becomes a policy imperative for any government.
5. A mechanism to reflect upon the profile of energy sources of a country.

~~Thus~~, United Nations' sustainable development goals also highlight the importance of ecological footprint and its importance to measure the sustainable use of resources.



4. The CRZ Notification, 2018 aims to maintain a balance between economic growth and conservation principles of coastal regions. Discuss

The Government of India has notified Coastal Regulation Zone Notification, 2018 to regulate the activities in the sensitive coastal areas.

It aims to strike a balance between economic growth and environmental conservation as below:

## Environmental Conservation

1. All the islands have been provided with a no development zone (NDZ) of 20m.
2. NDZ of 20m is also provided for coastal backwaters.
3. Special facilities for reducing pollution have been permitted in coastal areas.
4. Integrated Management Plans (IMPs) have

to be developed for critically vulnerable and ecologically sensitive areas.

## Economic Growth

1. The floor space index (FSI) has been relaxed for CRZ-II areas i.e. urban areas. This would improve urban housing facilities.
2. Tourism infrastructure has been permitted in the NDZ but it has to be temporary. (toilets, changing rooms, etc.)
3. The clearance for developmental projects has been streamlined.

	<u>Authority for Clearance</u>
CRZ - I	Central Government
CRZ II	State Government
CRZ III	State Government
CRZ - IV	Central Government

However there are concerns raised by ~~some~~ section of citizens that this process of CRZ notification has not been consultative. and such developmental activities can negatively affect the livelihoods of fisherman villages on the Indian coast.

5. Fertilizers have been one of the key inputs in the agricultural sector since Green revolution in India. In this context, give an account of distribution of fertilizer industry in India.

The improved irrigation facilities and high yield varieties (HYV) seeds during green revolution have resulted in increased use of fertilizers manifold. The self-sufficiency of India's food needs can be attributed to the revolution.

Fertilizers are still the most important inputs for agriculture with an average use of 130 kg per hectare in India.

The distribution of fertilizer industry in India is shown below:

1. Near petroleum refineries - The naptiq based fertilizer industries are based adjacent to the petroleum refineries. Some of the locations are - Panipat,

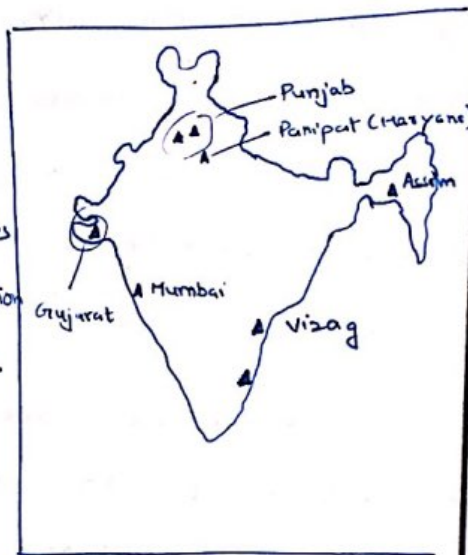
Bombay, Visakhapatnam, Gujarat, Assam, and others.

2. Import dependent - Most of the natural gas required for manufacturing urea is imported. Hence such industries are situated at ports.

3. Pipeline based

The laying of pipelines has helped in dispersion of fertilizer industry.

Examples are - Ropar and Bathinda in Punjab, etc.



4. Phosphate based - Most of these are dependent on locally available raw material and located in Rajasthan, Madhya Pradesh,

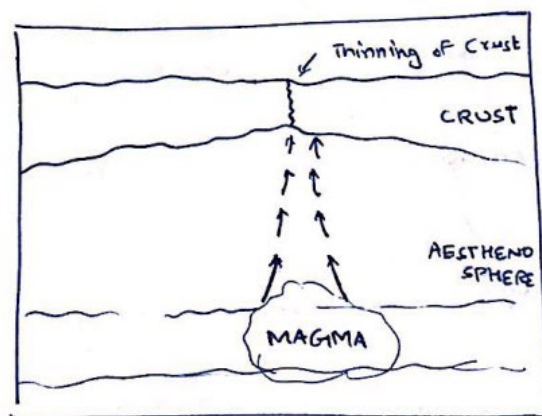
Fertilizer industry is one of the core industries of India and has witnessed rapid growth in the past decades.

6. Giving example, explain how continental rapture ultimately results in formation of a new ocean basin.

Continental rapture refers to the thinning and eventually rupturing of continental crust as a result of various endogenic forces.

## Phenomenon of continental rapture and formation of new ocean basin

1. Cause - Whenever the ~~ocean~~ continental crust is situated above a hotspot, it experiences thinning of the crust. Gradually the crust starts cracking.



2. As the crust ruptures, it starts moving away from the crack, forming a divergent plate boundary.

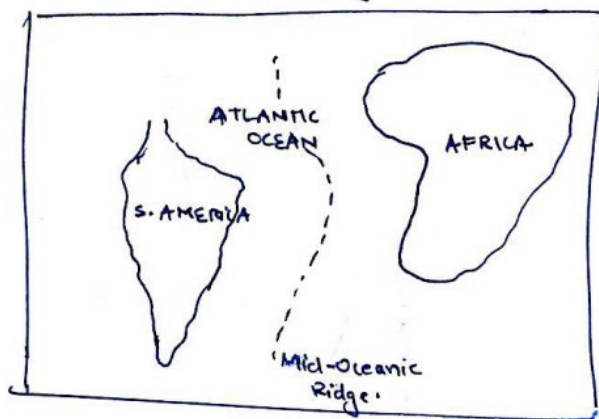
East African Rift Valley is an example of this stage.

3. Gradually, the rift widens and allows the ocean water to accumulate inside it,

The floor keeps spreading (as per sea-floor spreading hypothesis) and the ocean grows in size, with mid oceanic ridge between it.

Atlantic Ocean is an example of this stage

4. This can be observed by the near perfect fit of the diverging landmasses.



Thus the phenomenon of continental rupture and ocean formation represents the dynamic nature of the earth.

7. COVID-19 has exposed gaps in India's domestic laws to deal effectively with outbreaks of infectious diseases, especially pandemics. Discuss

COVID-19 has tested the effectiveness of the global healthcare infrastructure. The outcomes are not so comforting in most parts of the world, including India.

~~The legal~~

Legal structure for pandemic in India

The governments of centre and state depended on two laws to deal with the pandemic:

1. Disaster Management Act, 2005
2. Epidemics Act, 1896

Gaps observed

COVID-19 was the first pandemic observed ~~at~~ under the present constitutional machinery, thus proving a disadvantage of no prior experience.

2. Pandemics were not included in the 'notified disasters' till now.
3. Severe restrictions were placed by the central government on the people. However the responsibility to lift these were left to the states.
4. States, with limited financial capacity were found unable to provide even the basic needs to people. (like water, food for needy).
5. The haphazard reverse migration brought to light the lack of institutional mechanism for interstate coordination in times of crisis.
6. National Disaster Response Fund and State Disaster Response Funds were found to be insufficient to the needs.

COVID-19 pandemic is the first but certainly not the last to strike. It is imperative to learn from the problems witnessed and strengthen the regulatory mechanism to handle such pandemics in future.



8. Give an account of the increasing frequency of cyclonic activity in Arabian Sea region.

Arabian sea region is believed to be less cyclone prone as compared to the Bay of Bengal area. Cold sea surface temperatures, high wind shear are some of the reasons for this.

However the number of cyclones in the Arabian sea have increased manifold since 2000. Some of the recent cyclones have also been of severe category. Nisargg is an example. An account of this is given below:

1. Indian Ocean dipole (IOD), which is the see-saw arrangement in sea surface temperatures of west Indian ocean and the Pacific Ocean has been positive in recent decades. This has resulted in warmer Arabian sea.

2. Global warming has resulted in disturbance of heat redistribution by jet streams, resulting in warmer Arabian sea.
3. Increase in evaporation rates has resulted in low wind shear in Arabian sea, which promotes cyclone formation.
4. Greater warming results in more buoyant surface waters and less intermixing. This increases the sea surface temperatures.

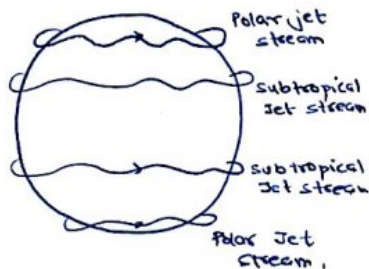
Given the changing global climate patterns, such climate related disasters are bound to increase. UN office for Disaster Risk Reduction (UNISDR) calls for institutional & infrastructural enhancement to deal effectively with such unavoidable disasters.

9. Explain the phenomenon of sudden stratospheric warming witnessed in recent years. How does it affect the ozone hole formation over Antarctica.

Sudden stratospheric warming refers to a dramatic rise in temperatures of the stratosphere. It is mostly observed in the northern hemisphere, although now observed in southern hemisphere as well.

## Phenomenon

Upper stratosphere witnesses jet streams which are strong westerly winds. Polar jet streams are of important concern to understand sudden stratospheric warming.



When sun approaches the southern hemisphere this polar jet stream weakens

This results in rapid rise in temperature of the stratosphere.

## Effect on ozone hole formation

Due to ~~ozone~~ stratospheric warming, there are lesser polar stratospheric clouds formed. Thus the ozone depleting substances are unable to carry out the reactions which release chlorine and Bromine.

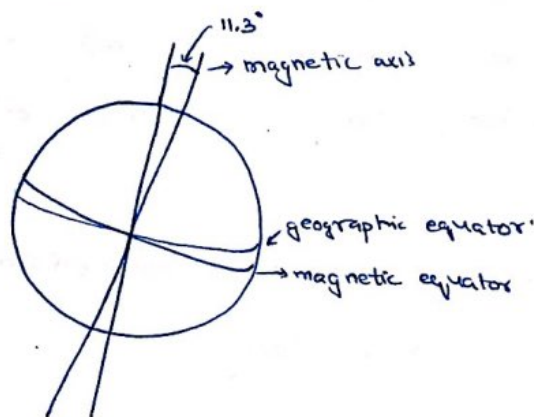
Thus, the ozone hole formed over Antarctica ~~leads~~ slowly diminishes with time. This has been observed in the recent years.

10. Write a brief note on Earth's magnetism and its role in protecting the Earth from solar winds.

Earth's magnetism behaves like a giant bar magnet placed at the core of the earth. The magnetic axis or magnetism of earth is a dynamic phenomenon and keeps changing with geological time periods.

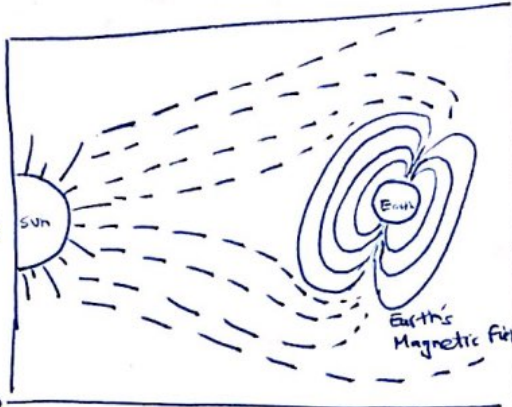
### Reason for earth's magnetism

The most acceptable explanation is the presence of convection currents in the molten iron and nickel (NiFe) layer in outer core of the earth. These currents induce magnetic field around the earth.



## Mechanism of protection from solar winds

1. The earth's magnetism forms a shield of magnetosphere around the earth.



2. The solar winds, which consist of charged particles are continuously directed outwards from the sun.

3. Magnetic field of earth deflects these particles and preventing them from entering the stratosphere, which contains important ozone. Destruction<sup>(or ionization)</sup> of ozone gas would result in ultraviolet rays reaching earth surface and damaging life form.

4. Phenomenon of aurora borealis and aurora australis occur at north and south pole respectively due to ionization effect by ~~sun~~ solar winds.

In this way, earth's magnetism makes the planet earth a living planet.

11. How does climate change affect the process of desertification?

United Nations Convention to Combat Desertification (UNCCD) defines desertification as the deterioration of land in arid, semi-arid areas due to reasons varying from human to climate change.

Although, the main reason for desertification are human activities like unsustainable agricultural practices, extension of deforestation, disappearance of green belts, etc. But the process is accelerated due to climate change, as mentioned below:

## Desertification due to climate change

1. Rainfall patterns have changed drastically due to climate change, thus affecting the soil productivity and <sup>thus</sup> desertification.
2. Drought prone areas have gone upto one third of country's land areas.

3. Increasing events of sudden and heavy rainfall result in soil erosion at a very fast rate.
4. Lower rainfall results in high dependence on groundwater, thus resulting in fall in groundwater levels. This fall is as severe as 70-110 cm per year in areas of Punjab.
5. Instances of soil salinity have increased in various districts of Andhra Pradesh and Punjab.
6. Climate change results in reduction of soil organic carbon (SOC) content, which further affects productivity.
7. Himalayan regions have witnessed drop in average rainfall, resulting in many perennial streams turning dry. This will further result in drop in groundwater levels.



Govt. of India has taken various steps to combat desertification. Some of these are mentioned below:

1. Signatory to UNCCD
2. Bonn Challenge declaration to increase the afforestation area of 8 million hectares by 2030 (in addition to 13 million hectares by 2020)
3. Target to achieve Land Degradation Neutrality (LDN) by 2030, as part of SDGs of UN.

Increasing population and its needs, changing climate and increasing climate related setbacks pose a challenging triad for India. A wise and sustainable use of all the resources, including land is the need of the hour.

12. Discuss the increasing need of 'disaster resilient infrastructure' in India. Mention the steps taken in this direction with specific reference to the Global Coalition for Disaster-Resilient Infrastructure.

Disaster resilient infrastructure means such type of infrastructure that can withstand the natural or man made disasters, thus reducing the risk and vulnerability of the population.

### Increasing Need ?

1. Frequency of climate related disasters has increased.
2. Reactive strategies (providing relief, rescue, etc.) prove to be challenging and a drain on resources.
3. Increasing population has led to problems like haphazard urbanisation, low standard housing infrastructure, etc.

4. Vulnerable sections of society are at high risk during disasters. Resilient infrastructures would reduce these risks

### Steps taken for Disaster Resilient Infrastructure

Global Coalition for Disaster Resilient Infrastructure ~~has~~ in an India-led initiative to mitigate the risk posed by various disasters. Some of the steps undertaken are mentioned below:

1. A common institutional setup to coordinate among different nations during disasters.
2. ~~has~~ Mechanism to finalize the standards of disaster proof infrastructure for disaster prone areas.
2. Use of technology for zone mapping and vulnerability risk assessment with

respect to various disasters.

3. Building of shelter homes for coastal areas has been a successful initiative. This helped in better evacuation plan implementation during cyclone Amphan.

The need for disaster resilient infrastructure is also emphasised in 'Sendai Framework for Disaster Risk Reduction (2015-30)'. Thus a focus should be kept on 'build back better' to invest in a safe & resilient infrastructure. The same has been highlighted in the National Disaster Management Policy (NDMP), 2019.

13. Identify the important mineral belts of India. Highlighting some of the issues plaguing the mining sector in India, discuss how the National Mineral Policy, 2019 aims to address these issues.

India is a resource rich country, endowed with a large variety of minerals like coal, petroleum, iron, bauxite, monazite, copper, gold, etc.

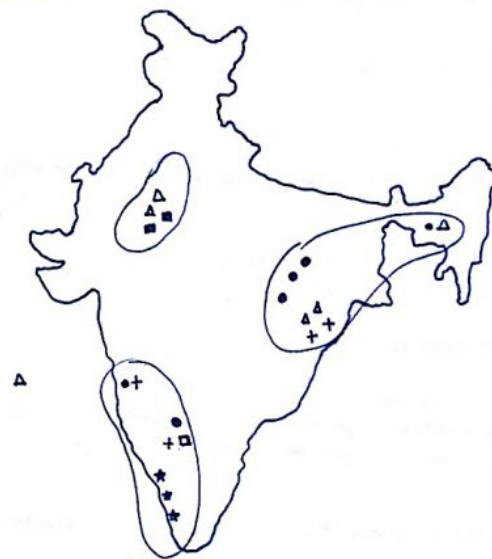
## Mineral belts of India

### 1. North Eastern Belt - This

includes important minerals like coal, iron ore, petroleum, etc.

Imp. places are

Jharia, Bokaro, Chattisgarh, Odisha, etc.



- △ Petroleum
- Coal
- ★ Monazite
- Gold
- Uranium
- + Iron

2. North western Belt - Important minerals like copper, Uranium, petroleum reserves, coal bed methane are found in Rajasthan (Khetri, Jodhpur), Madhya Pradesh, Gujarat, etc.
3. Southern Belt - States of Goa, Karnataka are rich in coal and iron ore. Coasts of Kerala are rich in monazite sand, an important mineral for future nuclear programme.

Although abundant minerals are found in India, yet it imports way more than it produces.

## Issues plaguing mining sector

1. Unscientific mining methods lead to lower productivity. As an example, coal productivity is 16 t/oms in India as compared to 60 t/oms in Australia.

2. Unstable policy environment discourages foreign and private investments in this sector.
3. Environmental concerns like - acid mine drainage, deforestation, land degradation etc. are a major issue.
4. Issues of rehabilitation have increased due to increasing population.
5. Labour laws and DGMS safety norms are flouted. As per NITI Aayog, only 8% mines are provided with regular health checkup.
6. Illegal mining is believed to be 20% of total.

National Mineral Policy, 2019 addresses these as follows:

1. A long term policy guideline would attract FDI.
2. Provisions for on demand exploration license.
3. Policy outlined for collaboration with foreign entities for scientific exploration.
4. CSR expenditure can be used for R&D.
5. Strict implementation of DGMS rules.

14. Not only is the spatial and temporal distribution of freshwater in India very skewed, but also its usage inefficient and wasteful. Discuss in context of the current water crisis.

NITI Aayog's Composite Water Management Index, 2018 report indicates that by 2030, India's water demand would be double of its available supply. This highlights the water crisis India is facing.

## Spatial & Temporal distribution of freshwater

1. ~~Most~~ Northern India, with its Ganga, Brahmaputra & Indus basins has most of the freshwater with little present in peninsular rivers.
2. The alluvial aquifers are a good storage of freshwater as compared to the peninsular impermeable rocks.
3. Most of the rainfall (75%) in India



is from south-west monsoon, concentrated in the months of June to October.

4. The Himalayan rivers have a perennial flow due to meltwaters whereas the peninsular rivers run dry most of the year (except some like Kaveri)

## Inefficient and wasteful usage

1. Agriculture uses 80% of the freshwater used. This is due to increased area under cultivation of water guzzling crops like sugarcane & paddy.
2. Only 8% of the rain water is utilised in India, rest being sent into oceans.
3. Frequent floods, lack of rivers interlinking result in waste of <sup>flood</sup> waters.
4. Inefficient irrigation ~~capacity~~ practices, like canal irrigation have low water use efficiency, as low as 35%.
5. Untreated waste discharge into rivers

leads to deterioration of quality, making it unfit for use.

6. ~~Sp~~ Unproductive subsidies like free electricity have resulted in drop in water levels, varying from 30 cm to 70-100 cm per year in areas like Punjab.
7. Inefficient management of dam waters leads to frequent droughts.
8. Ecological flow of rivers is affected by the developmental activities.

The current water crisis is bound to worsen in coming future. The NITI Aayog report predicts cities to run dry by 2022. Thus important emphasis on rainwater harvesting, river interlinking, dam management, etc. needs to be given.

15. Examine how resource efficiency can bring about multiple benefits along the three dimensions of sustainable development - economic, social and environmental - in India.

Resource efficiency refers to the judicious use of available resources to get the maximum output. It can be measured in terms of gross output per <sup>quantity of</sup> resources used.

It can prove beneficial with respect to the three dimensions of sustainable development i.e. economic, social and environmental.

## 1. Economic

- 1.1. ~~Approx~~ Recent recession due to COVID-19 calls for extraordinary measures for speedy recovery. Resource efficiency can help GDP bounce back quicker.
- 1.2. India depends on imports for its energy needs (80% of crude imported).

Resource efficiency will help in bringing trade deficit down.

1.3 It would provide competitive advantage to the exporting industries.

1.4 Cost cutting is the main source of profit for industries nowadays. Resource efficiency provides the opportunity for the same.

## 2. Social

2.1 Around 22% of Indians live below poverty line. Resource efficiency would help in distributing the proceeds of development equitably.

2.2 Since government is the major player to provide basic needs services, it is found lacking in many fields like healthcare, education, etc.

2.3 It provides a way to ensure intergenerational equity.

2.4 It can help in better policy planning to ensure locally available resources are used wisely to uplift all sections of the society.

## 3. Environmental

3.1 The rampant deforestation to exploit resources can be brought down.

3.2 Urban waste is a major environmental concern today. It can be brought down with resource efficient processes.

3.3 Efficient recovery of useful metals from e-waste can help in both ways - lower resource exploitation & lower waste.

3.4 Problems of air pollution (e.g. stubble burning), water pollution (Ganga river pollution), etc. can be brought down.

India ~~has~~ is in a tricky situation of parallel needs where it faces dilemma between poverty eradication as well as environmental safeguard. Resource efficiency can prove to be a ~~balancing~~ tool to bring equilibrium between the two.

16. Highlighting the significance of unconventional hydrocarbons, discuss the issues faced in their exploration and extraction.

Unconventional hydrocarbons refer to those sources of energy which require unconventional scientific methods for their exploration and extraction. Some of its examples are coal bed methane (CBM), polymetallic nodules, shale gas, shale oil, etc.

## Significance of unconventional hydrocarbons

1. Conventional sources of hydrocarbons have proved to be environment polluting. Example -
  - (a) Mercury,  $SO_2$ , PM emission from coal based thermal power plants
  - (b) Incidents of oil spillages in oceans
  - (c) vehicular pollution
2. The available / explored reserves of conventional hydrocarbons are limited. Further exploration is proving <sup>to be</sup> a costly affair
3. Unconventional hydrocarbons are believed to be in huge reserves as compared

to conventional ones.

4. The growth of developing countries in 21st century would witness a huge demand for energy. It can be met through unconventional hydrocarbons.

5. Cartelisation of energy suppliers have kept energy prices high in past. such monopoly can be avoided.

However the exploration and extraction of these hydrocarbons faces several issues.

## Issues

1. Technological advancements are still in nascent stages.  
Eg.- India is still developing the technology to extract shale gas.
2. Concerns related to pollution & environmental degradation have arisen. like -
  - 2.1 Shale gas extraction requires fracking, which can pollute the ground water, affect aquatic life.
  - 2.2 Polymetallic nodule (PMN) extraction can ~~be~~ disturb the ocean carbon cycle leading to release of oceanic carbon

into atmosphere leading to global warming.

3. Lack of internationally combined efforts to develop technology to explore these resources.
4. International seabed Authority (ISA) has allotted 80,000 km<sup>2</sup> in Indian Ocean to India for exploration. The Deep Sea Mission is still to take off for its exploration.

Burgeoning population, increasing energy demands, degrading environment, global warming, etc. provide an impetus to look towards alternate sources of energy. However the same must be carried out keeping in mind the environmental responsibility.



17. What is Soil Organic Carbon (SOC)? Identify various factors affecting SOC levels. Also, highlight the beneficial impacts of SOC on soil health and functionality.

Soil Organic Carbon (SOC) is the carbon content present in the soil, which is generally sourced from the dead and decaying matter of living and non-living organisms.

## Factors affecting SOC

1. Climate - Warm and humid climate results in greater primary productivity, thus more SOC.  
Cold and dry climatic regions have lower decomposing capacity, thus leading to accumulation of SOC.
2. Rainfall/Precipitation - Greater precipitation would mean greater primary productivity thus more SOC.

3. Type of soil - clayey soils have higher SOC as compared to the sandy soils.
4. Topography - Soils at higher latitudes are generally poor in SOC, whereas in the valley and at roots of mountains have higher SOC.

## Beneficial impacts of SOC

1. Higher SOC is a good source of nutrient supply to the plants
2. It improves the granular structure of the soil thus improving the soil aeration.
3. It acts as the feeding matter of various dendritic organisms, which further help in improving the soil health.
4. Adequate amount of SOC provides better permeability to the soil. This helps in better water holding

capacity of soils.

5. The soil tith and suitability for various crops depends on the SOC present in it.

Soil organic carbon is an important indicator of soil health, as measured by UNCCD. Improvement in soil organic carbon helps in better soil health, global carbon cycle stability and thus helps in mitigating the climate change.

18. Ocean deoxygenation is one of the most detrimental, yet under reported side effects of human induced climate change. Identify the causes behind it. Also mention its ~~socio~~ socio-economic and environmental implications for the world.

Ocean deoxygenation refers to the reduction in oxygen levels in the top layers of world oceans. It is also termed as hypoxia.

## Causes of hypoxia

1. Eutrophication is the increased nutrient supply to a water body. This results in increased primary productivity and thus increased oxygen consumption in oceans.
2. Climate change results in warming up of oceans. warm waters hold less oxygen as compared to cold waters.
3. ~~the~~ Rise in temperatures leads to increased metabolism rate of aquatic

animals, thus depleting oceanic oxygen.

## Socio-economic Implications

1. Dead zones have increased in last two decades. This results in lower aquatic production.
2. The ~~fishermen~~ fishing sector will observe increased losses as it will have to venture deep into the oceans for fishing activities.
3. Deoxygenated waters often lead to algal blooms (as observed in Lonar lake, Maharashtra). These algal blooms are many a times harmful for human health.

## Environmental Implications

1. It leads to imbalance in aquatic life. While benthic zones increases, photic zone reduces in size.
2. It leads to increased acidity of the oceans, thus resulting in dissolution of carbon shells of various aquatic organisms.

3. Oceans absorb 82% of the carbon emissions. Ocean deoxygenation disturbs this cycle.
4. It may lead to release of ~~various~~ sequestered carbon in oceans, furthering global warming,

Human induced climate change has its adverse effects. These are propounded more evidently for oceanic ecosystem. Urgent policy guidelines, concerted efforts are required to be taken to mitigate these negative effects.

19. Approach to flood control in India should evolve from piecemeal measures to an integrated basin management. Comment.

Floods are an annual phenomenon in India. Some of the states like Bihar, Assam witness floods every year due to the Brahmaputra and Ganga river systems. Such instances can be cited all over India.

## Current approach to flood control

1. Building embankments along rivers
2. Construction of dams to regulate river water flow
3. Dredging of riverbeds to improve the water carrying capacity.

## Why are these piecemeal measures insufficient?

1. Dredging is an expensive exercise. Moreover rivers like Brahmaputra bring a large amount of silt every year, thus making dredging a futile exercise.

2. Dams themselves are unable to hold the excess waters during peak seasons. Sudden release of water often results in floods, as observed in Kerala floods.
3. The embankments are susceptible to erosion continuously, resulting in frequent breaches.

Thus it seems important to look towards integrated basin management as a solution which entails following features:

1. Considering river basin as a single unit for planning.
2. It helps in modifying the water flow effectively according to needs of the whole basin.
3. Important initiatives like increased green cover in areas of rivers origin as well as surrounding the rivers provide better silt control as well as better embankments.
4. It provides a mechanism for inter-state coordination for flood solutions.



5. It is a participative river management technique which provides inputs from all stakeholders. ~~in river~~

A large percentage of GDP is lost every year due to floods. Thus, adopting a multi-disciplinary approach to flood management is pertinent for wise river water utilisation.

20. Programmes for cleaning polluted rivers in India have been implemented for a long time. However, the results of these programmes are not very encouraging. Identify the reasons for the same and possible steps to rectify the solution.

A recent report by TERI highlights that the number of polluted ~~segment~~ stretches has increased to 354 in 2018. This shows that the programmes for cleaning polluted rivers in India have not been successful.

A case in point is of the Namami Gange Programme. Spanning across the states of Uttarakhand, Uttar Pradesh, Bihar and West Bengal, this programme was funded extensively in the past 6 years. However the level of pollution in Ganga river is still critical.

## Reasons for below par performance

1. Lack of basin level approach.
2. Inter-state conflicts often results in inordinate delays.
3. Haphazard urbanisation results in unplanned sewage treatment facilities.
4. Unscientific waste handling practices.
5. Violation of environmental norms by the industries.
6. Lack of ecological flow in the rivers has reduced the self rejuvenating capacity of rivers.

## Possible steps to rectify

1. Shift from piecemeal measures to basin level approach.
2. Real time collection of river samples to ascertain performance of different initiatives.
3. Strict enforcement measures for the

polluting industries.

4. Innovative solutions involving bioremediation to be promoted.
5. Entrepreneurship in waste treatment sector to be promoted.
6. Extended producer responsibility should be implemented in all sectors..

River Health is an important target to be achieved under Sustainable development goals, 2030. A time-bound and dedicated efforts towards this initiative should be taken at the earliest.