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GENERAL STUDIES (TEST CODE : 1051)

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Medium Eng./Hindi	English	Registration Number	80110
Center	Karol Bagh (DL)	Date	11/08/18

INDEX TABLE

Q. No.	Maximum Marks	Marks Obtained
1	10	
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15	15	
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17	15	
18	15	
19	15	
20	15	

Total Marks Obtained:

Remarks:

INSTRUCTIONS

1. 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)।
2. There are TWENTY questions printed in ENGLISH & HINDI
   इसमें बीस प्रश्न हैं अंग्रेजी और हिन्दी में छपे हैं।
3. All questions are compulsory.
   सभी प्रश्न अनिवार्य हैं।
4. The number of marks carried by a question/part is indicated against it.
   प्रत्येक प्रश्न/भाग के अंक उसके सामने दिए गए हैं।
5. 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 that 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।
6. Word limit in questions, if specified, should be adhered to.
   प्रश्नों में शब्द सीमा, जहाँ विनिर्दिष्ट है, का अनुसरण किया जाना चाहिए।
7. 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।

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.

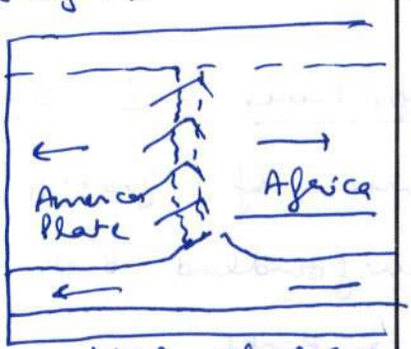
All the Best

1. The mapping of ocean floor reveals complex and varied features, which rival the relief features on land. Discuss the reasons for the formation of main relief features of ocean along with their significance. **(150 words) 10**

महासागरीय अधस्तल के मानचित्रण से जटिल और विविध आकृतियों का पता चलता है, जो स्थलीय उच्चावचीय आकृतियों के तुल्य हैं। महासागरों की मुख्य उच्चावच आकृतियों के निर्माण के कारणों तथा उनके महत्व की चर्चा कीजिए।

Mapping of sea floor was done by a no. of expeditions like GLOMAR, challenger expeditions etc.

Reasons : ① MoR (Mid ocean ridge) is formed due to divergence of Plate boundaries (Fig. 1)



MoR of Atlantic

Fig. 1

② Trenches are formed along the Convergent boundary Eg. Aleutian, Kuril, Japan basin. (Fig. 2)

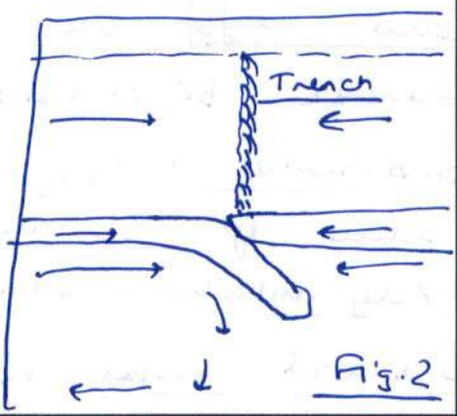


Fig. 2

③ Submarine Canyons like Hudson Canyons, Indus Canyon etc.

are formed due to Turbidity Currents

(4) Banks, shoals and reefs

(1) Banks and shoals are formed due to deposition of various sediments

(2) Reefs are of Biological origin and are formed due to compaction of skeletons of Coral polyps

Importance : (1) Banks are major source of fishing sites Eg: Newfoundland Bank (USA), Doggers Bank (North sea)

(2) Provide harbour for ships → Banks

(3) Coral reefs are region of immense biodiversity

(4) Submarine ridges are major source of various minerals & ki Poly metallic nodules, Metallic sulphides

(5) Continental slopes have immense oil resources. Eg: Persian gulf

2. What is inversion of temperature? Discuss the various mechanisms of occurence of this phenomenon along with its climatic and economic significance. **(150 words) 10**

तापमान व्युत्क्रमण क्या है? इसके जलवायविक और आर्थिक महत्व के साथ इस परिघटना के घटित होने से संबंधित विभिन्न क्रियाविधियों पर चर्चा कीजिए।

Normally, temperature in atmosphere decreases with height with atmospheric lapse rate of 6.5°C/km. However under certain conditions, temperature may increase with height which is known as temperature inversion

Factors :-

① Radiation inversion :- In cold, winter nights, with cleary sky, because of radiation of heat by ground surface, temperature may go down drastically. The lower layer in contact will cool due to conduction, causing inversion (Fig.1)

This page was sticked with Q.3 page so by mistake I wrote the other half of 2nd Question on next page (Q-3 - 2nd half).

This is answer to 2nd half of Question no. 3

Framework :-

(1) The foremost institution to deal with industrial disaster is NDMA under Disaster Management Act 2006

(2) National Disaster response force in association with state level institutions like Police, Fire Brigade etc. are first responders of such disasters. Eg: Specific battalions to deal with Chemical, Nuclear disasters

(3) Environmental impact Assessment as well as regular inspections and reports are taken to ensure that systems are functioning properly

(4) Dedicated departments Eg. Department of Atomic energy for Nuclear safety

(5) Special liability laws are there in some cases like Nuclear liability law and other Compensation funds for relief

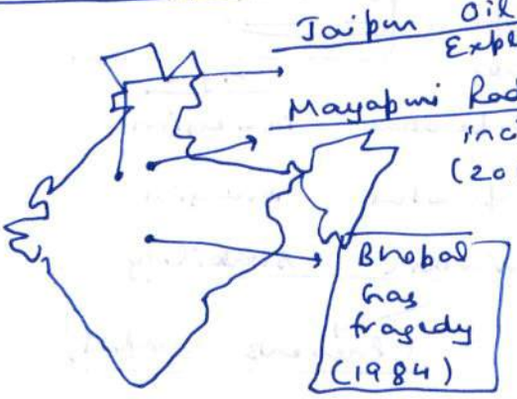
Don't write anything this margin (इस भाग में कुछ ना लिखें)

3. With rapid industrialization, the threat of industrial disasters has increased. Explain the meaning of industrial disaster with adequate examples. Also, highlight the legal and institutional framework to reduce the risk during such events. **(150 words) 10**

तीव्र औद्योगीकरण के साथ, औद्योगिक आपदाओं का खतरा बढ़ गया है। यथोचित उदाहरण देते हुए औद्योगिक आपदा के अर्थ की व्याख्या कीजिए। साथ ही, ऐसी घटनाओं के दौरान जोखिम को कम करने के लिए कानूनी और संस्थागत ढांचे पर भी प्रकाश डालिए।

Industrial disasters refer to any incident during production or supply of industrial products which may lead to release of harmful gases, explosions etc which is beyond capacity of industrial mechanisms to control

Examples



These can occur in any industry like chemicals, nuclear, Pharma etc.

Eg: International :- Fukushima Nuclear disaster

This is answer to 2nd half of Q.2

(2) Frontal inversion as warm air moves over cold air in frontal conditions, temperature inversion takes place

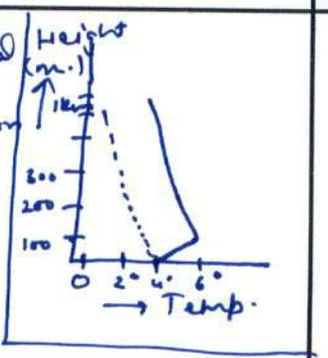


Fig. 1

(3) Advection :- In certain areas, there may be case where warm air starts moving over cold air.

Eg. (i) Around Coasts (Fig. 2)

(ii) Meeting of cold and warm currents

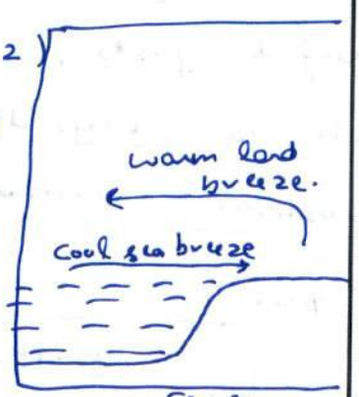


Fig. 2

(4) In hilly areas, cold air moves downslope and settle in valley region causing temperature inversion

Importance :- (1) Temperature inversion gives rise to climatic stability which

(Gives rise to Fog)

(Prevents rainfall)

(2) It may cause navigation hazard around ports.

(3) Formation of smogs in cities is due to this

4. What are 'dead zones'? Mention the reasons for their formation. Explain, in brief, the impact of such dead zones. **(150 words) 10**

'मृत क्षेत्र' (डेड जोन) क्या हैं? इनके निर्माण के कारणों का उल्लेख कीजिए। ऐसे मृत क्षेत्रों के प्रभाव की संक्षेप में व्याख्या कीजिए।

Dead zones are those marine zones which are characterized by

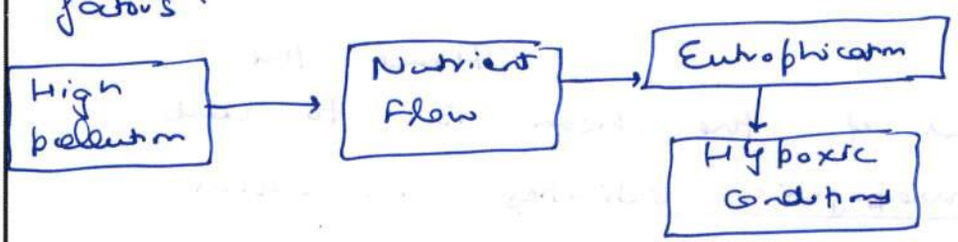
(i) Very low or almost nil oxygen presence.

(ii) Loss of Biodiversity

(iii) Sucking of nitrogen from rest of the oceans.

Recently a dead zone has been found in Bay of bengal in around 10000 km^2 area

Causes :- The major cause of formation of dead zone is pollution caused by anthropogenic factors.



(2) Other factors like oil spills also cause such conditions.

(3) Invasion of alien species High BOD (biological oxygen demand) leads to loss of oxygen.

Impact :- (1) Creation of dead zones leads to loss of Biodiversity in such zones

(2) It sucks nitrogen out of the surrounding marine environment which further creates imbalance in marine ecosystem.

(3) Such zones are also known to create climatic impact due to reduced CO_2 sequestration and release of other GHG gases.

Hence the need of the hour is to curb anthropogenic activities in coastal areas, over exploitation etc.

5. Stating the differences between deltas and alluvial fans, highlight the factors responsible for their formation. Also, briefly bring out the economic importance of these two depositional landform types. **(150 words) 10**

डेल्टा और जलोढ़ पंख के मध्य अंतर बताते हुए, उनके निर्माण के लिए उत्तरदायी कारकों पर प्रकाश डालिए। साथ ही, इन दो निक्षेपात्मक भू-आकृतिक प्रकारों के आर्थिक महत्व को भी संक्षेप में बताइए।

Deltas and alluvial fans are both features associated with riverine processes

Formation :- Formation of both is associated with Rivers' inability to carry the sediment load due to reduction in speed

Ability to carry load $\propto$ (velocity)^6

↳ Gilbert's 6th power law

Differences :

Alluvial Fans	Delta
① These are formed around footHills due to sudden decrease in velocity	① Deltas are formed near the mouth of the river

as river enters plain region

Eg: Bhabhar zone in Himalayan foothills by Ganga (Fig. 1)

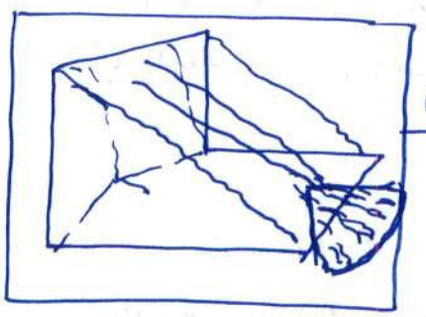


Fig. 1

(2) Associated with transition from youthful to mature stage

(3) Sediment size is much bigger but amount is less

as river is unable to carry huge sediment load.

Eg: Ganga - Brahamputra delta.

(2) Associated with old stage of river

(3) Comparatively smaller size of sediments but huge quantities of sediments.

Importance - (1) Both are vital ecology and have agricultural importance. Eg: GB delta is known for Jute, rice cultivation.

(2) Tourism capabilities Eg: Sagar Island in G-B delta.

(3) Potential of mineral deposits like placer deposits

6. What do you understand by Inter Tropical Convergence Zone (ITCZ)? Discuss the annual fluctuations and shifting of ITCZ belt and its significance for India. **(150 words) 10**

अंत: उष्ण कटिबंधीय अभिसरण क्षेत्र (ITCZ) से आप क्या समझते हैं? ITCZ पेटी के वार्षिक परिवर्तन और स्थानांतरण एवं भारत के लिए इसके महत्व पर चर्चा कीजिए।

Inter tropical Convergence zone refers to the region of meeting place of the Trade winds from northern and southern hemisphere

(Fig. 1) ITCZ and its fluctuations

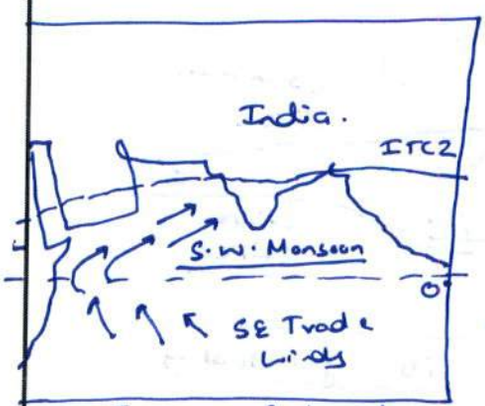
Fluctuations :- ① As shown in Fig. 1 ITCZ moves northwards and southwards with similar apparent movements of sun in Northern Summer and winter respectively

② Movement is much larger over Continents of Asia and Africa (upto 20° latitude)

and much less over Oceans due to high heat over Continents.

Significance :-

(1) Shifting of ITCZ is crucial for Monsoon of India as it brings S-E trade winds into India (Fig. 2) as S-W winds



June - September

Fig. 2

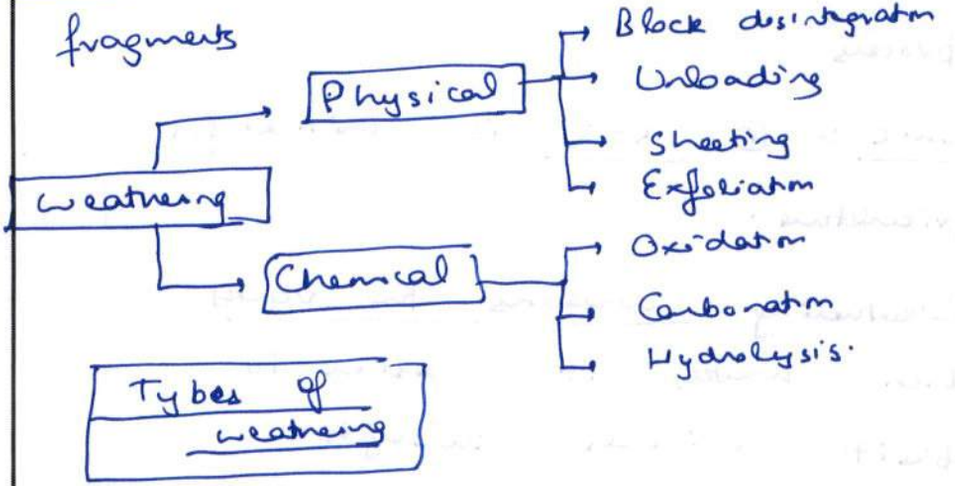
(2) Position of ITCZ is closely associated with Movement of Tropical Easterly Jetstream with steers cyclonic disturbances from Bay of Bengal in India.

(3) IF ITCZ shifts around Foothills of Himalayas, it leads to break in Monsoon and heavy floods in Foothills region

7. What is weathering? Discuss the ecological and economic significance of the process. **(150 words) 10**

अपक्षय क्या है? इस प्रक्रिया के पारिस्थितिकीय और आर्थिक महत्व पर चर्चा कीजिए।

Weathering is a process of disintegration and decomposition of rocks, insitu, into smaller fragments



Significance :

(1) Ecological :- (i) First critical step in formation of soil

(ii) It leads to formation of a number of landforms and is crucial step in formation of erosional landforms

(3) Weathering of rocks also leads to supply of nutrients to the plants

(4) All the major biomes are actually a result of weathering process

Economic :- (1) Soil is critical for agriculture.

(2) Weathering weakens the rocks which makes it easier to exploit minerals through mining

(3) It (especially chemical weathering) also enriches and enhances Concentration of various minerals like Iron ore, manganese, copper etc. in the rocks which makes them economically viable to exploit.

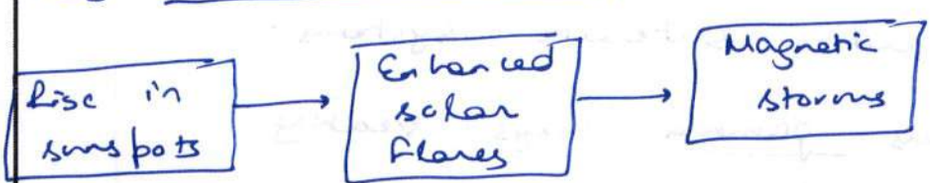
(4) Loss of money due to repairing of damaged structure due to weathering

8. Explain the concept of Sun-spot cycle. In view of the approaching Solar minimum, highlight the changes that it brings on sun's surface and the effects that it has on earth. **(150 words) 10**

सौर कलंक चक्र की अवधारणा की व्याख्या कीजिए। आसन्न सोलर मिनिमम के परिप्रेक्ष्य में, सूर्य की सतह पर उत्पन्न होने वाले परिवर्तनों और इसके द्वारा पृथ्वी पर पड़ने वाले प्रभावों पर प्रकाश डालिए।

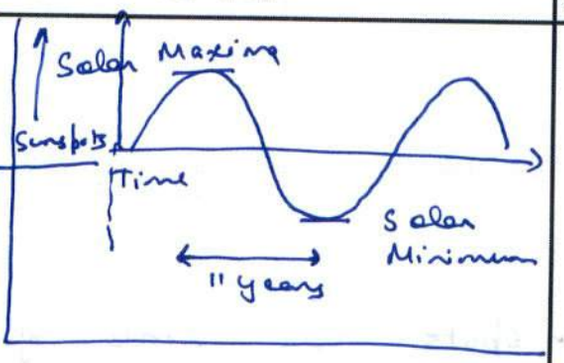
Sun spots are zones of cold areas on the photosphere layer of sun an are dark zones compared to surroundings

Sunspot cycle refers to periodic (11 years) rise and fall in number and concentration of sunspots which has immense significance



Solar minimum :- This is the time of least sunspots on the surface of the sun's photosphere

Impact :-



(1) It leads to least magnetic storms and activities on the surface of the sun causing least sunspots

(2) For earth it means that there will be less magnetic storms breaching magnetic field lines.

(3) Less disruptions of communication and satellite systems.

(4) Less gamma rays reaching earth surface.

(5) Less formation of Auroras in North and South Pole regions

(6) A possible rise in global temperatures aggravating global warming

9. What is Pacific Ocean Garbage Patch? Provide an account for the factors responsible for its development and location. Also, discuss its impacts and suggest measures for mitigation. **(150 words) 10**

पैसिफिक ओशन गार्बेज पैच क्या है? इसके विकास एवं अवस्थिति के लिए उत्तरदायी कारकों का विवरण प्रस्तुत कीजिए। साथ ही, इसके प्रभावों पर चर्चा कीजिए और शमन के उपाय भी सुझाइए।

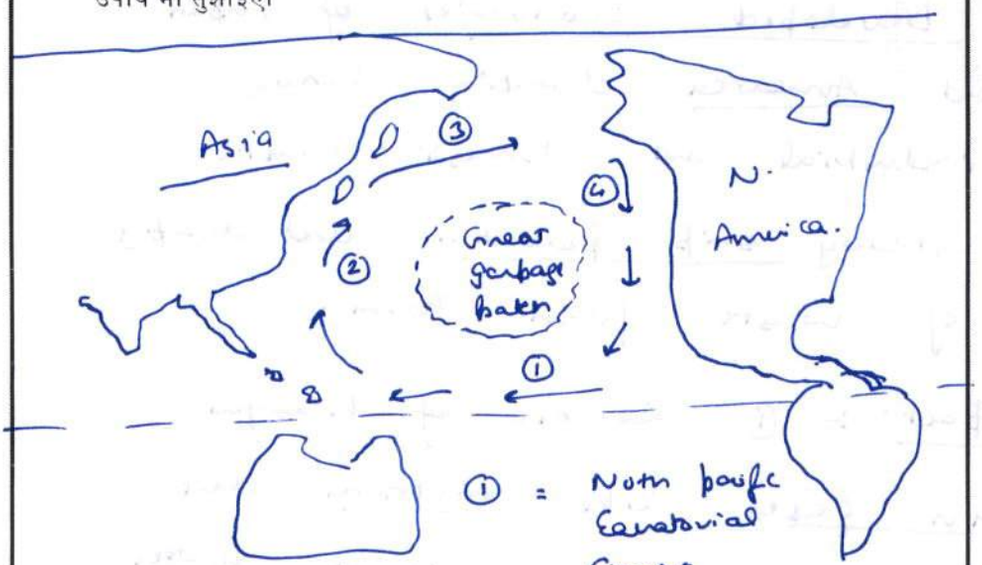


Fig. 1

Great pacific garbage patch is a patch of garbage (mainly Plastic) floating in the Northern Pacific ocean between the circular gyre

① factors :- (i) Gyral movement of current (Fig.) leads to concentration of garbage in the centre.

(ii) Developed economies of Japan and America dumping heavy industrial and domestic waste

(iii) Heavy ship pollution and dumping of waste from them.

Impact :- ① Release of harmful GHG gases like Methane due to decomposition of organic matter

② Harm to biodiversity due to plastic pollution and consumption

③ Impact of human health due to fish consumption and biomagnification

Remedy measures :- ① Reduction in marine pollution in line with London Convention on ship pollution

② Enforcement of UNCLOS which talks about Marine pollution

③ Reduction in domestic plastic consumption and recycling

Case study
- Bluefin Tuna fish is on verge of extinction due to this

10. Explain the formation of mid-oceanic ridges in different oceanic basins of the world. **(150 words) 10**

विश्व के विभिन्न महासागरीय नितलों में मध्य महासागरीय कटकों के निर्माण की व्याख्या कीजिए।

Midoceanic ridges cover over 70000 km in continous chains over the ocean sea floor

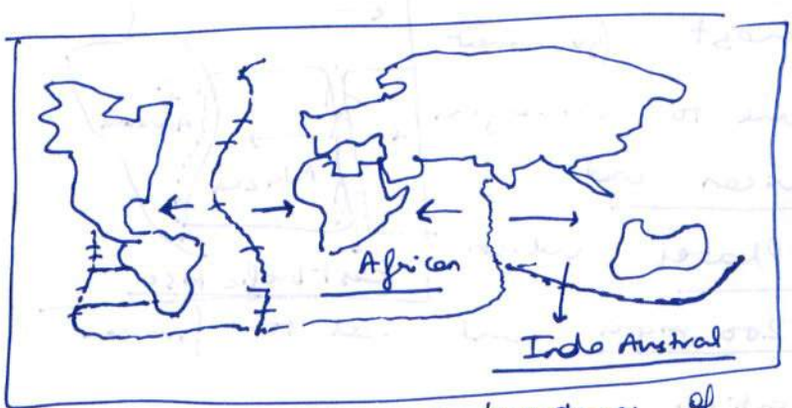
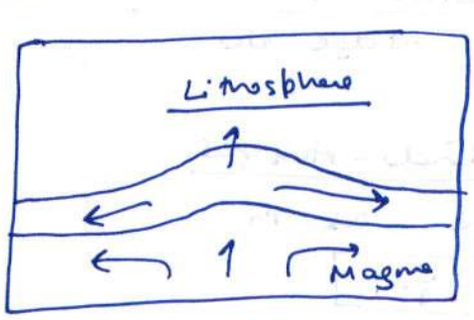
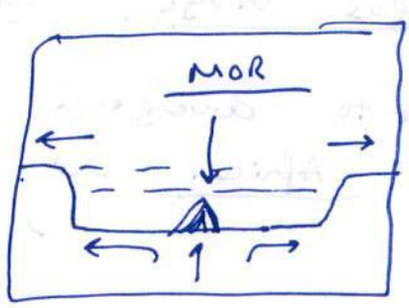


Fig. 1 Divergent boundaries of world

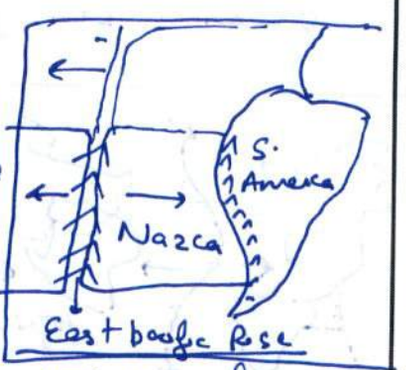
formation of mid oceanic ridges is associated with the divergent boundary





(1) Pacific :- In pacific, MOR can be seen in the form of East pacific rise as Nazca plate diverges from Pacific Plate

(2) Atlantic ocean has the most prominent MOR due to divergence of American and African Plates which began 200 mya and led to formation of Atlantic.



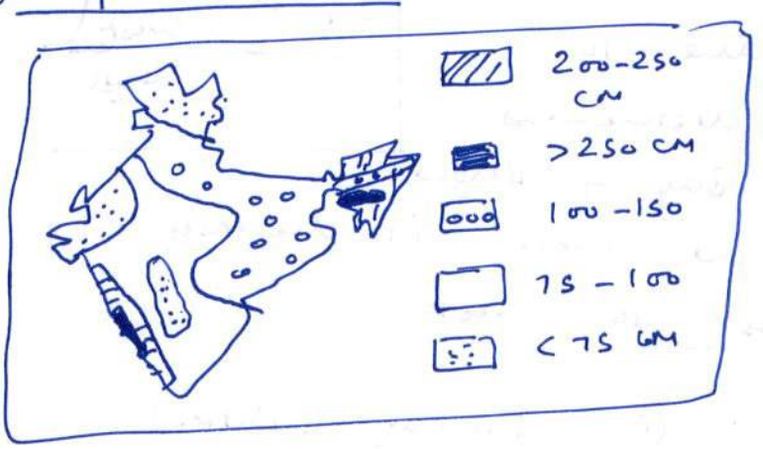
(3) In Indian ocean, the MOR is in the form of a number of ridges like Lakshadweep, Chagos ridge, Amsterdam - St. Paul ridge etc. due to divergence of African and Indo-Australian Plate as in Fig. 1

11. Discuss the spatial and temporal variation of rainfall in India. Has this pattern been changing in recent years? Examine. **(250 words) 15**

भारत में वर्षा की स्थानिक और कालिक भिन्नता पर चर्चा कीजिए। क्या हाल के वर्षों में यह पैटर्न परिवर्तित होता रहा है? परीक्षण कीजिए।

India receives about 1200 mm of rainfall annually however with great spatial and temporal variation

① Spatial Variation :-

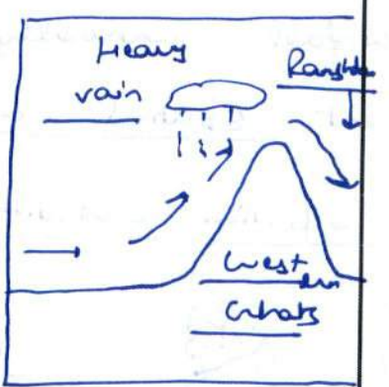


Causes :- ① Western Ghats, AAN and North East India receives heavy orographic rainfall due to direct impact of Monsoon (Arabian and Bay of Bengal branch

② Western Rajasthan and parts of Andhra and Karnataka receives very low rainfall due to

(i) Monsoon winds moving parallel to Aravali

(ii) Arabian branch has rainshadow effect as it crosses Western Ghats.



(3) Over rest of the country, rainfall is mainly due to Cyclonic disturbances led by Bay of Bengal branch and here it decreases from east to west

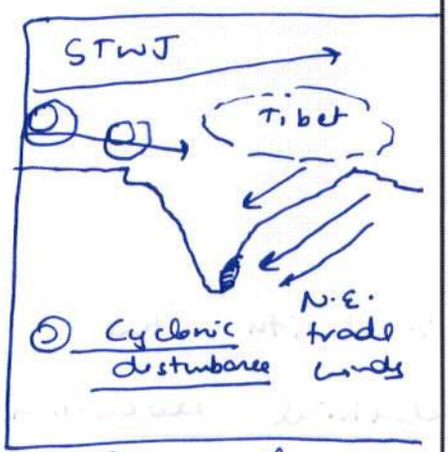
Temporal :- (1) Annual (Intra) / Seasonal)

(i) Most of the rainfall (over 80%) Concentrated in June to September due to shifting of ITCZ northwards and incoming of On shore S-W winds

(ii) Winter rainfall in Northern

plains and parts of Tamilnadu (Fig. 3)

(ii.) Intra annual variation due to various causes like Elnino, Madden Julian oscillation, Indian ocean dipole



Causes of winter rainfall

Changing pattern

(1) Over rainfall is on a decline due to rising phenomenon of El-Nino as noted by IPCC

(2) Frequency of high intensity rainfalls have increased due to rising temperatures (Economic Survey 2017-18)

(3) More formation of cyclones in Bay of Bengal due to Rising temperatures

(4) Weakening of S.W. Monsoon winds due to temperature rise in Arabian Sea

12. Technology has provided important tools for making disaster management more effective. Elaborate with special focus on the role of technology in reducing disaster risk. Also highlight the challenges in application of technological solutions in disaster affected areas. **(250 words) 15**

आपदा प्रबंधन को अधिक प्रभावी बनाने हेतु प्रौद्योगिकी ने महत्वपूर्ण साधन प्रदान किए हैं। आपदा जोखिम न्यूनीकरण में प्रौद्योगिकी की भूमिका पर विशेष ध्यान केंद्रित करते हुए सविस्तार वर्णन कीजिए। साथ ही, आपदा प्रभावित क्षेत्रों में तकनीकी समाधानों के अनुप्रयोग में आने वाली चुनौतियों पर भी प्रकाश डालिए।

Ans :- With the advent of 4th Industrial revolution, the role of technology has become even more in every sphere especially in disaster management.

Role of technology

(1) Space technology :- Satellites have been used to measure global sea temperatures, prediction of climate disasters like Cyclones, Tsunamis etc.
Eg. INSAT 3-D of India

(2) Early warning systems :-
Usage of cyber technology has

been done to quickly alarm people and enhance early warning systems

Eg. Sagar Vani app

(ii) Electronic sensors for early prediction.

Eg. German based Tsunami Early warning systems deployed in Gurgaon

(3.) Robotics and Nano technology.

These have immense usage in dealing with industrial disasters where humans may not reach

(ii) Drones may be used for surveillance as well as evacuation

(4) Usage of cloud seedings to avert formation of cyclones

(5) Internet of things and Artificial Intelligence can provide quick response in case of infrastructure

Eg: A building connected with IoT may automatically turn off electricity in case of Earthquakes or chemical leak to avoid fires

Challenges :- (1) Lack of Funds

(2) Difficult to hold technological systems as mostly power supplies get cut off during disaster

(3) Difficult to install such complicated systems in poor regions as well as difficult geographical terrains

(4) Low R&D in India

The need of the hour is to blend modern technology with traditional knowledge like Earthquake proof traditional homes like Ekra (Assam), Dhungas (Gujarat) etc.

13. While overcrowding in public places cannot be wished away in India, what we need are better infrastructure and more effective crowd-control measures. Comment. Also, briefly enumerate NDMA guidelines for crowd management. **(250 words) 15**

यद्यपि भारत में सार्वजनिक स्थलों पर अत्यधिक भीड़भाड़ को कम नहीं किया जा सकता है, तथापि हमें बेहतर अवसंरचना और अधिक प्रभावी भीड़-नियंत्रण उपायों की आवश्यकता है। टिप्पणी कीजिए। साथ ही, भीड़ प्रबंधन के लिए NDMA के दिशानिर्देशों को संक्षेप में सूचीबद्ध कीजिए।

India is a country with rising urban population, high density (384 / sq km) and large no. of religious congregations which makes overcrowding inevitable

Recent incidents like Stampede in Elphinstone Railway station (Mumbai) highlights the need to have better infrastructure

Need of better infrastructure and crowd control

(1) Lack of proper event planning and footfall estimates

(2) Lack of citizen friendly

direction maps

(3) Less no. of exit points

(4) Police issues
- Low police / crowd ratio
- Lack of critical equipments like Barricades, Mike, Batons etc.

(5) Lack of retrofitting of infrastructure

(6) Unruly crowd at times

(7) Lack of adequate awareness among people regarding steps to be taken in case of stampede.

NDMA Guidelines

(1) For event managers

(i) There should be proper estimates of footfall

(ii) Proper direction related maps at critical locations.

(iii) Availability of medical and firebrigade services at standby in case of any issues

(iv) Proper barricading and queue system

(v) Multiple exit points

Police :- (1) Police must maintain regular contact and communicatn with crowd via loud speakers

(ii) Maintainance of proper crowd-Police ratio.

(3) There shouldn't be any gas cylinder unchecked around the crowd

(4) For crowd :- (i) Donot Panic

(ii) In case of panic, move with hands around chest (similar to Boxers)

(iii) Look for side places to stand etc.

14. State the conditions that are conducive for the formation of coral reefs. Mention the anthropogenic factors that have resulted in their decline. Also highlight its consequences. **(250 words) 15**

प्रवाल भित्तियों के विकास के लिए अनुकूल दशाएँ बताइए। उन मानवीय क्रियाकलापों का उल्लेख कीजिए जिनके परिणामस्वरूप प्रवाल भित्तियों का ह्रास हुआ है। साथ ही, इसके परिणामों पर भी प्रकाश डालिए।

Coral reefs are major marine ecosystems and are called as rainforests of the oceans

Conditions :-

(1) Appropriate temperature (26-28°C)

(2) Suitable submarine platform (at about 30-50 m depth)

(3) Salinity should be appropriate (30-35 ‰) and neither too low, nor too high.

(4) Sediment free water and hence they are not found around river mouths

(5) Regular supply of nutrients through wave action Eg. High Concentration in

Upwelling zones

(6) Presence of coral polyps

Anthropogenic factors

(1) Dumping of waste leads to choking of coral polyps

(2) Pollution
- Oil spills cut off sunlight
- Dumping of ballast warm water leads to bleaching.

(3) Green house gas emission
- Leads to global warming and Coral bleaching.
- Ocean acidification and dissolution of coral reefs into sea water

(4) Overexploitation of biodiversity due to excess fishing

Case study
- Between 2016 and 2017, there has been over 50% decline in Great Barrier reef of reef

(5) Creation of barriers like sea walls etc. leads to low supply of nutrients.

Consequences :- (1) Heavy loss of Biodiversity. Eg: ElNino of 1997 led to death of 16% corals

(2) Increase in GHG emission due to lowered CO_2 sequestration

(3) Coral reefs act as breakwaters to cyclones, Tsunamis etc. and hence their decline leads to increased vulnerability.
Eg: Pichavaram, Muthupet and Bhitarkanika suffered less due to coral reefs in 2004 Tsunami

(4) Loss of tourism potential

(5) Impact on livelihood of fishermen

15. In combining the sea floor spreading theory with continental drift and information on global seismicity, the theory of Plate Tectonics provides a coherent explanation for crustal movements. Discuss. **(250 words) 15**

महाद्वीपीय विस्थापन सिद्धांत और वैश्विक भूकंपीयता के बारे में सूचना के साथ सागर अधस्तल विस्तार सिद्धांत को संयोजित करने से, प्लेट विवर्तनिकी सिद्धांत भूपर्पटी संचलन की एक सुसंगत व्याख्या प्रदान करता है। चर्चा कीजिए।

Plate tectonics is a major global framework, which was provided in 1960's, explaining various geological phenomenons including Orogeny, earthquakes, volcanoes etc.

(1) Continental drift, given by Wegner was the first major theory which challenged the paradigm of Permanency of ocean and continents and gave the idea of movement of continents through various Paleo climate, Geological evidences

(2) Sea floor spreading given by Harry Hess in 1960's contributed to Plate tectonics in following ways

(i) Corrected faults of Wegner

(i) It talked about movement of sea floor as well and not merely continents as envisaged by Wegner

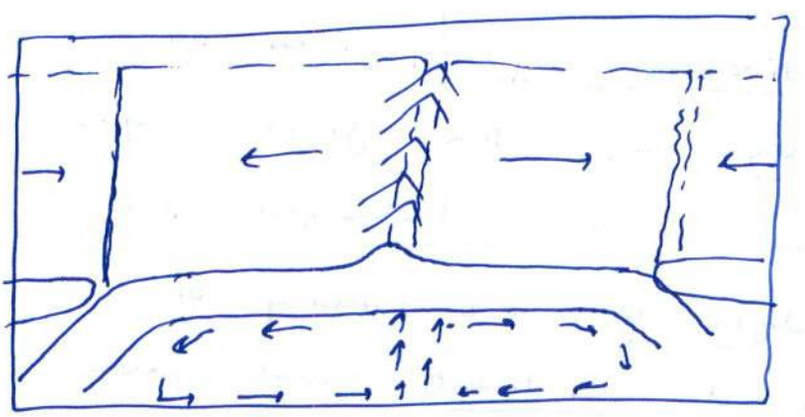
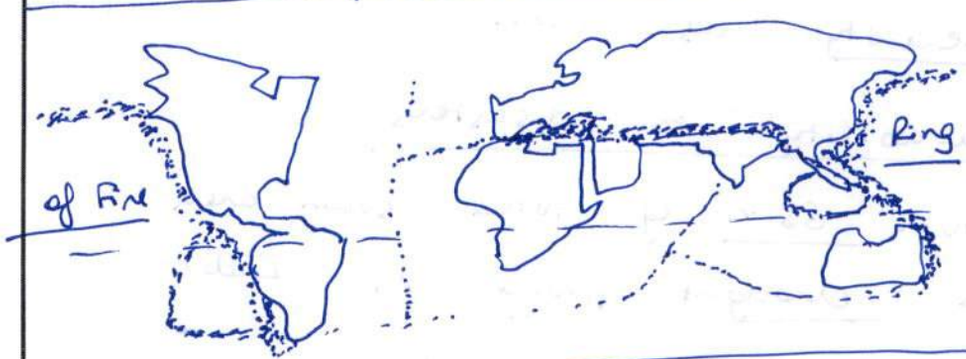


Fig. 1

(ii) Provided proper causal mechanism in the form of Convectional Current theory of Arthur Holmes

(iii) It was able to provide rough idea about demarcation of Plate boundaries in the form of Presence of MoR → Along divergent
Presence of Trenches → Along convergent boundaries

(3) Seismic studies :- Analysis of Earthquake map



areas of seismic activities provided the correct idea about the plate boundaries as well as type of boundaries. Eg: More earthquake along convergent boundaries

(ii) It also gave idea about subduction zones (Benioff zones)

16. Provide an appraisal of the vulnerability of the agriculture sector to natural disasters. What can be done to strengthen the resilience of the sector in order to reduce the impact of such disasters? **(250 words) 15**

प्राकृतिक आपदाओं के प्रति कृषि क्षेत्र की सुभेद्यता का आकलन कीजिए। ऐसी आपदाओं के प्रभाव को कम करने के लिए इस क्षेत्र की अनुकूलन क्षमता को सुदृढ़ करने हेतु क्या किया जा सकता है?

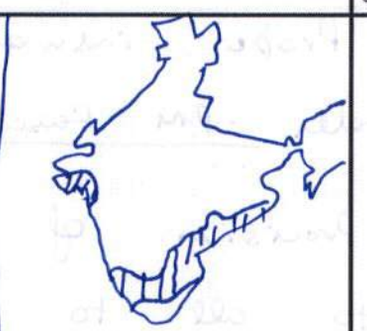
Agriculture forms the backbone of Indian economy as 50% of population is engaged in it and is crucial for food security as well

Vulnerability to disasters

(1) Over 68% of total sown area is drought prone in India especially in dry lands

(2) Coastal regions which include fishermen as well as coastal crop growers are vulnerable to cyclones, Tsunamis and soil salinization (Fig. 1)

(3) Over 40 million hectares of India, especially in river valleys of Ganga are prone to floods



Cyclone prone area

(4) There is also a biological disaster threat to agriculture due to some pest attacks. Eg: Pink ballworm destroyed Cotton crop recently

As economic survey (2017-18) noted all these threats are going to enhanced with rising global temperatures, which will reduce revenues by 20-25%.

Measures :-

(1) Diversification :- Agriculture need to be diversified and practices like Horticulture, Sericulture, Apiculture need to be promoted to reduce risks

(2) Proper insurance mechanism under PM Fasal Bima yojana

(3) Provision of irrigation facilities to all to check the impact of low rainfall under PM Krishi Sinchai yojana.

(4) Floods and droughts can be checked by adopting traditional water harvesting structures under water shed management.

(5) Developing proper Early warning systems

(6) Promoting adoption of drough resistant crops like Millets through suitable policy measures under MSP

(7) Creation of Buffer stocks to ensure food security

(8) Creation of additional jobs in other sectors

17. Explain what a drought is and describe its different types. Discussing the environmental and societal impacts of droughts, enumerate the factors that aggravate these. **(250 words) 15**

व्याख्या कीजिए कि सूखा क्या है तथा इसके विभिन्न प्रकारों का वर्णन कीजिए। सूखे के पर्यावरणीय और सामाजिक प्रभावों पर चर्चा करते हुए, इनकी गंभीरता को बढ़ाने वाले कारकों को सूचीबद्ध कीजिए।

Drought in simple terms refers to shortfall in moisture or water supply compared to the demand

Types :-

(1) Meteorological :- It occurs when there is shortage of rainfall

Eg: IMD terms shortfall of over ~~less~~ than 10% in more than 10% geographical area as drought.

(2) Hydrological :- It refers to drying up of waterbodies like rivers, lakes, ground water, local ponds, tanks etc.

(3) Agricultural :- When soil moisture is not

adequate for the required crops to be grown.

Impact :-

(1) Environmental

(i) Loss of moisture leads to death of plants and trees

(ii) In case of severe shortage, overall biodiversity may be lost / harmed

(iii) Drying up of soil creates conducive conditions for desertification

(iv) Riverine ecology will be impacted especially flora and fauna

(v) It may also lead to conditions of dust storm

(2) Societal :- (1) Loss of economy due to severe impact on

agriculture

(ii) Farmer suicides

(iii) Social unrest due to such large scale impact.

Aggravating ~~Forestry~~ measures :-

(1) Crops should be grown in accordance with agro-ecological regions, which is not there

(2) Diversification of agriculture, to enhance resilience via additional sources of income, is lacking

(3) Conservation of water is lacking
- Rainwater harvesting
- Measures like Mulching
- Watershed management

(4) Access to irrigation for all, under PM Krishi Sinchai yojana, is only about 50%.

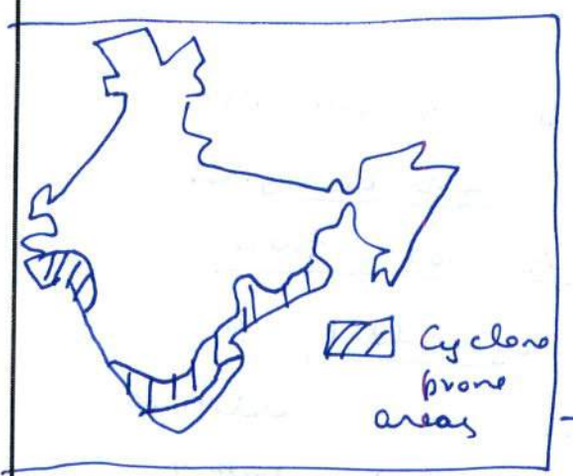
(5) Access to insurance facility (PM fasal Bima yojana) is only about 30%.

(6) Proper early warning systems are lacking

(7) Climate change

18. Assess the vulnerability of Indian coastal regions to cyclones. Also, mention the objectives and approach adopted by the National Cyclone Risk Mitigation Program (NCRMP) in this regard. **(250 words) 15**

चक्रवातों के प्रति भारतीय तटीय क्षेत्रों की सुभेद्यता का आकलन कीजिए। साथ ही, इस संबंध में राष्ट्रीय चक्रवात जोखिम शमन कार्यक्रम (NCRMP) द्वारा अपनाए गए उद्देश्यों और दृष्टिकोण का भी उल्लेख कीजिए।



Of about 7500 km of Coastline, over 5100 km is prone to Cyclones in India

Vulnerability :-

(1) India gets about 6-8 Cyclonic storms in a year (From both Bay of Bengal and Pacific) of which 2-3 can be severe

(2) Temporal aspect : Most cyclones visit during May to June and October to december

(3) Vulnerability is more towards Eastern Coast than west due to → Higher temperature of Bay of Bengal
→ Cyclones from Pacific ocean
→ Westward movement of cyclones

(4) Vulnerability is enhanced due to → Heavy population pressure
→ Poor Coastal infrastructure
→ Lacunas in early warning systems as well as evacuation measures as was visible in recent Cyclone Ockhi

(5) Tropical Climate and climate change are further increasing vulnerability

NCRMP :- It was launched in 2001 after Odisha Super Cyclone of 1999 whose objective is to minimize the impact of cyclones through reducing vulnerabilities and enhancing resilience

It takes a holistic approach for cyclones and seeks to —

(1) Create local level vulnerability and risk maps

(2) Development of world class technology for Early warning systems

(3) People's participation
- creating awareness
- Disaster Mock drills
- Focus on vulnerables

(4) Enhancing Coastal infrastructure to ensure speedy evacuation
Eg. Cyclone Phailin was dealt with efficiently

(5) Implementation of Coastal Mangement Rules to avoid unwanted infrastructure in coastal areas

(6) Coastal Vegetation like Mangroves need to be improved

(7) Horizontal and Vertical Coordination between different level of Authorities

19. What role have volcanoes played in formation of earth's atmosphere in the past? Elaborate on the impact of volcanic activity on climate change in contemporary times. **(250 words) 15**

अतीत में पृथ्वी के वायुमंडल के निर्माण में ज्वालामुखियों ने क्या भूमिका निभायी है? समकालीन समय में जलवायु परिवर्तन पर ज्वालामुखीय गतिविधियों के प्रभाव का सविस्तार वर्णन कीजिए।

Early earth's atmosphere was composed of only H_2 and Helium which was blown away by solar winds.

Volcanoes, through the proces of 'Degasing' released a number of gases including

CO_2, HCl
NO_2, NH_3
SO_2, etc.
H_2S, N_2 etc.

These were the first gases in the atmosphere.

(i) Since Nitrogen is almost inert, its composition has remained constant since then

(ii) Release of CO_2 gave birth to initial flora which then led to addition of Oxygen

Even today degassing is a major phenomenon who continues to add gases to atmosphere, though impact has reduced much

③ Release of CO_2 and Methane also led to stabilization of Earth's temperature due to greenhouse gas phenomenon

Impact of Volcanoes presently

① Volcanoes are known to have caused climate changes at least at regional level

Eg: Krakatao eruption of 1883 led to massive release of dust and ash in atmosphere which caused decline in global temperatures for next few years

Many geologists have stressed on the role of volcanoes on ice ages and age of glaciation and de-glaciation

However modern climate change characterized by rise in temperature has very less impact of Volcanic activities.

As per IPCC AR-5 report, current increase of Greenhouse gases has very minimal role of volcanoes and most of the global warming is due to 'Human made volcanoes' i.e. Industries, Automobile emissions, deforestation etc.

20. A need has been felt to demarcate aquifer systems in the country so as to provide critical information to plan for their sustainability. Analyse. Also, mention the steps taken by the Government of India in this regard.

(250 words) 15

देश में जलभृत (एक्विफर) प्रणालियों को सीमांकित करने की आवश्यकता का अनुभव किया जा रहा है, ताकि उनकी संधारणीयता संबंधी योजना बनाने हेतु महत्वपूर्ण सूचना प्रदान की जा सके। विश्लेषण कीजिए। साथ ही, इस संबंध में भारत सरकार द्वारा उठाए गए कदमों का भी उल्लेख कीजिए।

Aquifers are storage reservoirs of groundwater in subsurface regions of saturated ground water

Need to demarcate :- (1) Being an agrarian country. India's over 60% of irrigation needs are sourced from ground water

(2) Rapid exploitation. Eg. As per NASA report, 108 out of 126 aquifer blocks of Punjab are over exploited

(3) Pollution :- Various types of pollution (Fig. 1 and 2)

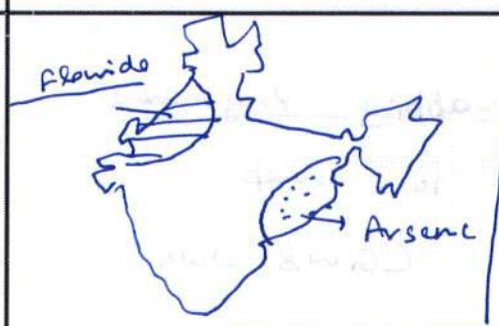


Fig 1

Fig. 2

(4) Groundwater are also source of our drinking water needs and problems of biomagnification can lead to diseases
Eg. Blue baby syndrome due to Nitrate pollution

(5) Also, surface water and groundwater ecology are deeply interlinked and hence demarcation is crucial to check issues of floods and droughts as noted by Mihir Shah Committee

(6) To check issues of soil salinization

Steps taken

(1) National aquifer mapping Programme has been launched to map aquifers based on CGWB data.

(2) Co-ordination among various organisations and ministries. Eg. GSI, ISRO, CGWB are Co-ordinating to use various satellite and geological information

(3) Aquifer mapping is also a component under PM Krishi Sinchai yojana and Namami Ganga

(4) Co-ordination with foreign govt. and organisation. Eg. One of objectives of NISAR (NASA and ISRO) satellite of USA and India seeks to map country's aquifers

(5) State level measures have been taken by a number of states like Haryana, Punjab etc.