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GENERAL STUDIES (TEST CODE : 1431)

Name of Candidate	DARPAN AHLUWALIA		
Medium Eng./Hindi	ENGLISH	Registration Number	214713
Center		Date	1st July '19

INDEX TABLE

Q. No.	Maximum Marks	Marks Obtained
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
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8	10	
9	10	
10	10	
11	15	
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16	15	
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।

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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. Giving examples, explain how land topography affects the regional and planetary wind systems. Also, differentiate between the westerlies of the northern and southern hemisphere. **(150 words) 10**

सोदाहरण व्याख्या कीजिए कि धरातलीय स्थलाकृति क्षेत्रीय और ग्रहीय पवन प्रणालियों को किस प्रकार प्रभावित करती है। साथ ही, उत्तरी और दक्षिणी गोलार्ध की पछुवा पवनों के मध्य अंतर स्पष्ट कीजिए।

Land topography affects both planetary (westerlies | trade winds | easterlies) and regional (secondary and local) winds in the following ways :-

- Planetary wind

→ Land - water distribution

In southern hemisphere, due to less landmass and open ocean, westerlies are more strong. They occur between 40-65°S latitude - roaring 40s; furious 50s; shrieking 60s; screaming 70s.

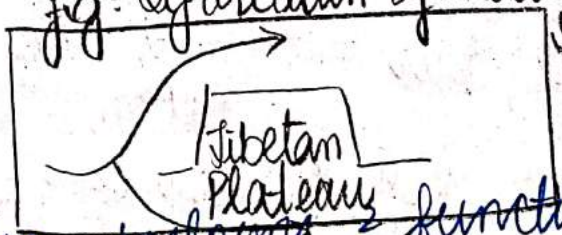
→ Uneven relief

Hence, Northern westerlies are irregular than southern.

- Regional wind

→ Highlands

fig: Bifurcation of Westerly Jet Stream



Eg: Tibetan plateau performs functions :-

Mechanical barrier to Westerly Jet Stream

Easterly Jet Stream due to heating in summers

anything this margin (इस भाग में कुछ ना लिखें)

→ Katabatic winds

Eg: Foehn (Alps); Chinook (Rockies); Bora (Adriatic sea).

These are warm winds, decreasing temperature on leeward side.

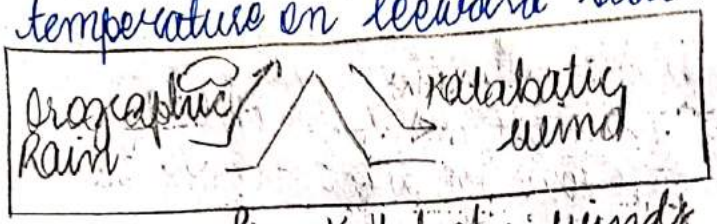


Fig: Katabatic winds

→ Land and sea breeze

This is due to liberal nature of land and convective water. Land gains and loses heat quickly in day and night (respectively).

→ Valley and mountain breeze:

In day and night time respectively.

WESTERLIES (30°-60°N/S)

⇒ North	South
• Blow in South-West direction.	• Blow north-west.
• Less strong and more irregular	• More strong due to vast, unhindered ocean.
• Stronger in Winters from Nov-February.	• Stronger from June-August.
• Impact of ozone depletion less.	• Impact of ozone depletion more, hence greater warming and stronger westerlies.

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

2. What is palaeomagnetism? Explain how it serves as a bridging evidence for Plate Tectonics Theory. **(150 words) 10**

पुराचुम्बकत्व क्या है? व्याख्या कीजिए कि यह किस प्रकार प्लेट विवर्तनिकी सिद्धांत के प्रमाण हेतु एक सेतु के रूप में कार्य करता है।

Palaeomagnetism is the study of Earth's magnetic field from rocks and sediments.

→

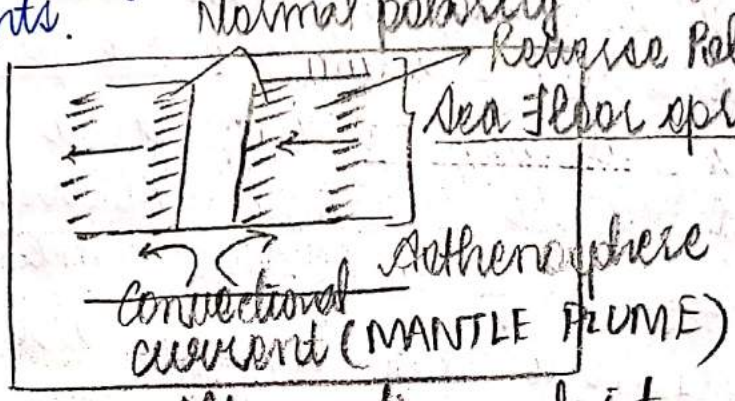


fig: Alternating polarity on either side of Mid-oceanic ridge

- It is seen that rocks on either side of Mid oceanic ridges (like Mid Atlantic ridge, African rift valley), have similar properties (age, constituents), which tells about direction and intensity of past magnetic field.
- There are alternating bands of normal and reverse polarity.

Plate tectonics refers to the lithospheric (crust and upper mantle) plates floating onto asthenosphere.

Palaeomagnetism acts as an evidence for plate tectonics as:-

- constructive plate margins occur in case of diverging plates.
- Basalt is released on either side of Mid oceanic ridge, from mantle plume.
- Basalt is rich in iron and silica deficient, hence contains impression of geomagnetic field of that time.
- Rocks thus made next to ridge are youngest and have normal polarity.

This gave the evidence of continuous sea floor spreading (Harry Hess). Thus, due to continuous interaction of oceanic lithospheric plates, they are younger than continental ones.

Thus, it served as an evidence for Morgan's theory of plate tectonics.

3. Mention the conditions responsible for occurrence of Temperature Inversion in atmosphere. Elaborating on its various types, highlight its effects on the biosphere. **(150 words) 10**

वायुमंडल में तापमान व्युत्क्रमण की घटना हेतु उत्तरदायी परिस्थितियों का उल्लेख कीजिए। इसके विभिन्न प्रकारों का सविस्तार वर्णन करते हुए, इसके द्वारा जैवमंडल पर पड़ने वाले प्रभावों पर प्रकाश डालिए।

Temperature inversion refers to the reversal of normal temperature behaviour in atmosphere (1°C decline with every 166m ascent). A layer of warm air covers the cold surface layer, preventing further convection currents.

⇒ Conditions needed :-

- Long night : Outgoing radiation will be more than incoming radiation of daytime.
- Calm and stable air : It will prevent any vertical mixing.
- Clear sky : Thus, there'll be unhindered escape of radiation.

⇒ Types of inversion are :-

- Valleys :-

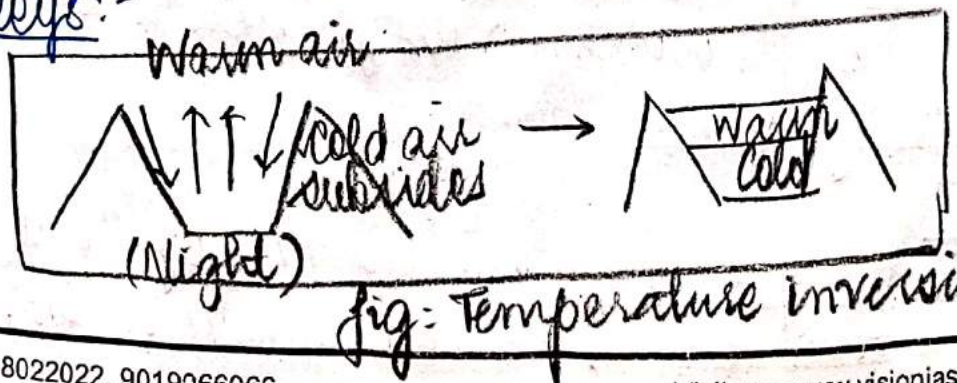


fig: Temperature inversion

Cold air from slopes subsides into the valley leading to temperature inversion.

- Cold, winter night → Surface temperature inversion :-

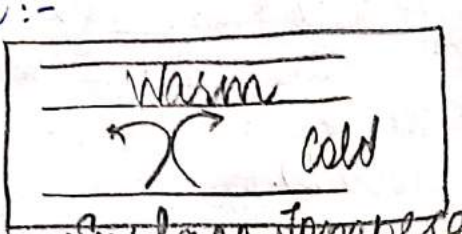


fig: Surface Temperature Inversion

- Frontal inversion : It occurs when a cold air mass uplifts a warmer one.

⇒ Effects on biosphere :-

- CONS :-
  - No upward convection, hence there is no rainfall.
  - It leads to collection of smog and pollution dome.
  - It causes frost.
  - Low visibility leads to accidents.
  - Houses have to be built on slopes only, as those in valleys reach below freezing point.
- PROS :-
  - Yemeni coffee is grown in valley as it is protected from direct sunrays. Etc.

4. 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. **(150 words) 10**

अर्थव्यवस्था के आधारभूत निर्माण खंड के रूप में लौह एवं इस्पात उद्योग के महत्व पर प्रकाश डालिए। इस संदर्भ में, राष्ट्रीय इस्पात नीति, 2017 की प्रमुख विशेषताओं पर चर्चा कीजिए।

Recently, India replaced Japan as the 2nd largest steel producer. Iron and steel is the backbone of the economy.

- Development is proportional to per capita steel consumption. (India: 69 kg; China: 525 kg)
- It is required for construction goods for sustaining urbanization and industrialization.
- It is vital to defence economy and security equipments.
- Transportation sector is also dependent.
- It contributes to 2% of GDP.
- Many direct and indirect employment opportunities are linked.
- Agricultural mechanization is dependent on iron and steel.
- Vital forex is earned. Eg: TATA steel is 5th largest producer.
- Thus, all - heavy/medium/light industries depend on it.

To give it impetus, many initiatives, like National Steel Policy 2017 have been undertaken :-

- Aim is self sufficient and globally competitive industry.
- To be a net exporter by 2025.
- It aims at increasing domestic coking coal, and decrease imports, from 85% to 65%.
- MSME sector would be given thrust.
- To decrease use of coking coal, more gas based steel plants and electric furnaces to be constructed.
- Coordination of Centre and states to provide litigation free lands.
- It aims at increasing per capita consumption to 160 kg, from 69 kg by 2030.
- SRTMI (Steel Research Technology Mission): To partner with private sector.
- It aims at 300 mn tn/yr of crude steel production by 2030.

⇒ Since rollout, ₹5000 cr have already been raised. Further thrust should be on technology infusion and economies of scale creation.

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5. Analyse the phenomenon of 'Resource Curse', by giving adequate examples from around the world as well as India. **(150 words) 10**

विश्व और भारत से यथोचित उदाहरण प्रस्तुत करते हुए 'संसाधन अभिशाप' की परिघटना का विश्लेषण कीजिए।

Resource curse refers to abundance of natural resources, paradonically leads to poor growth and development.

- concentrated investment occurs in one sector only, leading to crowding out in other sectors. This decreases manufacturing output.
- Due to dependence on single sector, there is fluctuation in revenue and GDP.
- Resources are extracted, and human resources are not paid attention to. This causes poor demographic indicators.
- Due to high exports, appreciation of currency occurs, making other exports uncompetitive.
- It is often associated with political conflicts, armed uprisings, and inequality.

Abundance of natural resources

- Poor manufacturing sector
  - Inequality
  - Armed conflict
  - Tribal uprisings
  - Political instability
- Poor human resource
  - Poor socioeconomic development
  - Poor employment
- Concentrated investment
  - Less focus on other sectors
  - GDP and revenue fluctuation

Examples :-

- Venezuela : Dependence on oil and natural gas only ; galloping hyperinflation seen today.
- Africa : Angola → Oil
  DRC → Diamonds
- Dutch disease : Natural gas export was primary focus, and it led to appreciation, and ultimately unfavourable trade balance and recession.
- India : Natural resource rich pockets are having scourge of Naxalism. There is rampant exploitation, and lack of penetration of schemes and programmes for development.

⇒ Thus, it is also called as 'Paradox of Plenty'.

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6. 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. **(150 words) 10**

भारत में संधारणीय आर्थिक विकास के लिए प्राकृतिक पूंजी की वृद्धि अपरिहार्य है। इस संदर्भ में, प्राकृतिक संसाधनों के प्रभावी प्रबंधन के लिए प्राकृतिक पूंजी लेखांकन (NCA) की अवधारणा, रणनीति और व्यापक नीतिगत दिशानिर्देशों का वर्णन कीजिए।

According to Inclusive Wealth report (UN-Environment), capital is divided as follows -:

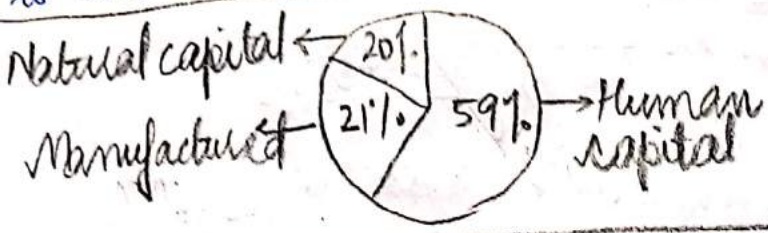

fig: 20% share of natural capital

- Although, natural capital is seeing a decline in growth rate (-0.7%), but it provides the raw material for secondary sector, and directly impacts primary sector production.
- Rampant exploitation will lead to cost to economy and ecology in the form of climate change related effects and resource crunch.

Hence, India has partnered with World Bank in WAVES (Wealth Accounting and Valuation of Ecosystem Services).

margin
(इस भाग में कुछ ना लिखें)

In this context, Natural Capital Accounting is:-

- CONCEPT → It is a tool to factor in positive and negative externalities on natural resources.
  It provides an overall and holistic picture of sustainable development.
  Eg: India aims at decreasing emission intensity of GDP by 33-35%.

- STRATEGY → It includes accounting for input of ecosystem services, and damage due to output creation process (Positive and negative cost).
  Eg: Amount of water used in fracking for shale gas extraction is a negative externality.

- GUIDELINES → * National Biodiversity action plan aims at valuation of goods and services.
  * Jobs for valuation of ecosystem services under Green Skill Development Program of ENVIS.
  * Capacity building of states by MoPSI's Natural Resource Accounting project.
  * Reduce cost by negative emission technologies (CCS; CCUS; Carbon sinks) etc.

7. Discuss the reasons behind increased instances of human-wildlife conflict and suggest some mitigation measures to address them. **(150 words) 10**

मानव-वन्यजीव संघर्ष के बढ़ते दृष्टांतों के पीछे उत्तरदायी कारणों पर चर्चा कीजिए और इनसे निपटने के लिए कुछ शमनकारी उपायों का सुझाव दीजिए।

1100 lives have been lost in man-animal conflicts from 2014-19 due to following reasons :-

- climate change and encroachment of forests has led to lack of water bodies and prey base.
- Disturbance of habitat due to poaching, fuel, food and firewood collection
- Habitat fragmentation and elimination of migration corridors.
- Cultivation of crops like sugarcane on periphery of forests.
- Settlements of people on forest periphery
- Increase in forest fires, droughts etc.
- **Outside Forest periphery :-**
  - Mostly, there are dog-man conflicts (6cr dogs are stray); monkey menace (HP); nilgai (Bihar) etc.
  - Reasons are : Improper waste disposal; lack of sterilization; invasive species eg - Bullfrog in Andamans destroys crops and chicken.

anything this margin (इस भाग में कुछ ना लिखें)

It can be mitigated by:-
- Kalra committee suggestions like animal and prey database maintenance, and re-established corridors.
- QRT of locals and volunteers should be roped in.
- Capacity building of forest personnel is needed.
- Biofencing should be done. In case of electrical fences, to prevent shock related animal deaths, coordination with electricity deptt.
- Insurance, compensation and rapid relief to public affected.
- Change in crop patterns (avoiding sugarcane | banana).
- Construction of ecobridges and under-bridges.
- Rejuvenation of water holes.
- Use of technology: Remote sensing, hyperspectral imaging, mass SMS alerts
- Novel techniques: Immunology contraception; 3D printing Rhino horns etc

Finally, best practices need to be disseminated, eg - Jharkand's app for tracking elephant movement etc.

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

8. Montreal Protocol is often considered as the most successful international environmental treaty. Highlighting the achievements of the protocol, discuss the reasons for its success. **(150 words) 10**

मांट्रियल प्रोटोकॉल को प्राय: सर्वाधिक सफल अंतर्राष्ट्रीय पर्यावरण संधि के रूप में माना जाता है। इस प्रोटोकॉल की उपलब्धियों पर प्रकाश डालते हुए, इसकी सफलता के कारणों पर चर्चा कीजिए।

Montreal Protocol (1987) has completed 3 decades of successful implementation. Ozone levels are expected to come back to 1980 level by 2045-60.

Its achievements are :-

- It has been universally ratified. No signatory opted out.
- US was the first ones to ratify it and contribute to 'Multilateral' fund set under it.
- CBDR (Common but Differentiated responsibility) was recognized under it.
- 99% of Ozone depleting substances (ODS) has been achieved.
- These ODS elimination has led to reduction of global warming also as many were releasing GHGs as well.
- Multilateral fund has been receiving continuous funds for phase out.
- Recent Kigali Amendment is aimed at eliminating HFCs.

Reasons for its success are -:

- Partnership of industry :- Companies have constantly innovated to produce non ODS for ACs and refrigerants.
- Establishment of multilateral fund and funding consensus.
- Mandate of trading of ODSs only with signatories, by members.
- CBDR mandated increase in role of developed countries, and greater finance and technology to developing ones.
- Scientists were also involved in negotiations.

So, there was enough of ozone depletion proof, unlike today, when many scientists are refuting global warming claims.

⇒ Further, there is a need to replenish multilateral fund and commitments, to achieve a similar success vert Kigali amendment.

9. Identify different factors that trigger Glacial Lake Outburst Floods. Also, suggest certain measures that need to be taken to minimize their impact. **(150 words) 10**

उन विभिन्न कारकों की पहचान कीजिए जो हिमनदीय झील प्रस्फोट जनित बाढ़ (ग्लेशियल लेक आउटबर्स्ट फ्लड) को प्रेरित करते हैं। साथ ही, इनके प्रभावों को न्यून करने हेतु किए जाने वाले कुछ आवश्यक उपायों का भी सुझाव दीजिए।

Glacial lake outburst floods are a great threat to the Himalayas / 3rd pole of the world.

They're formed by moraine (debris and loose soil) damming the water outflow from glacier. Break in this barrier causes GLOF.

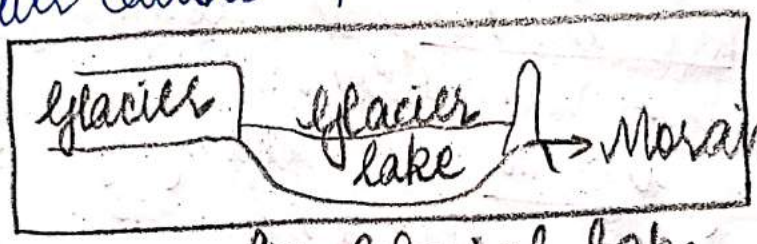

Fig: Glacial lake

GLOF is triggered by:-

- Landslides and avalanches break the moraine dam.
- Excessive rainfall leading to flash floods.
- It is triggered by water volume increasing with no outlet and poor seepage.
- Climate change induced melting.
- Natural erosion of moraines over time.
- Earthquake tremors
- Unsustainable tourism may also cause GLOF.

anything this margin (इस भाग में कुछ ना लिखें)

Measures to decrease impact include :-

- Outlet control : Evacuation of water.
  Eg : South Khonak lake (Sikkim) → Usage of polyethylene pipes.
- Sustainable tourism activities
  Eg : Restricting tourism numbers in vulnerable areas.
- Database : Of historical GLOFs and mapping of current vulnerable ones.
- Community : Resettlement from periphery of large glaciers and valleys.
- Early warning system : Via study of glacial movement, precipitation etc.
- Capacity building
  Eg : Forming regional meterological centre for Himalayas.
- International cooperation
  Eg : Glacial studies as a part of NISAR (NASA - ISRO Synthetic Aperture Radar)

⇒ Finally, broader aspect of mitigating climate change and global warming (which cause decrease in albedo) should be looked into.

10. Discuss India's vulnerability to chemical disasters. In this context, mention safety initiatives taken to address chemical risk in India. **(150 words) 10**

रासायनिक आपदाओं के प्रति भारत की सुभेद्यता पर चर्चा कीजिए। इस संदर्भ में, भारत में रासायनिक जोखिम से निपटने हेतु की गई सुरक्षा पहलों का उल्लेख कीजिए।

2019 marks 35 years of Bhopal gas tragedy due to MIC (methyl isocyanate release). The vulnerability to chemical disasters is still high.

- There is use of obsolete technology in industries.
- Lack of personal protection equipment, and no safety audit thereof.
- Poor coordination with hospitals; eg - to stock antidotes of chemicals used.
- Poor capacity building and awareness of District Disaster Management authority.
- Terrorist activities can also lead to sabotage.
- No QRT team of experts and volunteers.
- Maintenance schedules are flouted.
- Improper waste disposal measures.
- Moreover, many factories using hazardous chemicals are in unorganized sector.
- Human and technical errors can also occur.

Various safety initiatives w.r.t. chemical disasters are :-

- Legislations
  Petroleum act 1934; Explosives Act 1884; EPA 1986; Public liability insurance act 1991 etc.
- Hazardous waste management rules on collection, disposal and its treatment.
- Revamp of Chief Inspectorate of Factories and single window inspection and safety certificates.
- National action Plan on chemical disasters has been prepared by NDMA
  eg :→ Strengthening police and fire services
  → Inclusion of local volunteers and NCC, NSS, Nehru Yuva Sangathan and NGOs.
  → Temporary relief camps with essential items in vulnerable areas.
  → STF from affected families.
  → capacity building of community viz safety audit, mock drills, training volunteers etc.

⇒ Improved governance and regulatory oversight with community participation is the key.

11. Differentiate between eustatic and isostatic type of sea-level changes. Also, discuss the resultant landforms which are likely to be formed as a result of sea-level fluctuations. **(250 words) 15**

सुस्थितिक और समस्थितिक प्रकार के सागर तल परिवर्तनों के मध्य अंतर स्पष्ट कीजिए। साथ ही, सागर-तल के उतार-चढ़ाव के परिणामस्वरूप निर्मित होने वाली संभावित परिणामी भू-आकृतियों की भी चर्चा कीजिए।

According to 5th Assessment report of IPCC, sea level will rise by upto 1m by 2100.

These changes in sea level may be isostatic or eustatic.

EUSTATIC	ISOSTATIC
• It is a global phenomena.	• It occurs locally.
• Cause: Change in shape or volume of ocean basin.	• Cause: Change in local land level.
• Effect: Increase in volume of basin leads to decline in sea level (eg - tectonic changes)	• Effect: Rise in land level causes decline in sea level (and vice-versa).
• Ice age: Glacier formation decreased sea level.	• Ice age: Glaciers compressed land, lowering it, hence sea level rise.

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Various landforms created are :-

- Dependent upon type of 'rejuvenation' :-

River Rejuvenation

Positive

↓

Due to rise in sea level or fall in land level

↓

Loss of erosive power

* Knick point

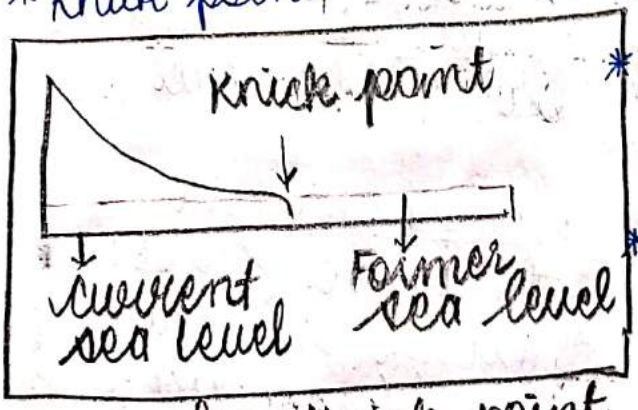

fig: Knick point

Negative

↓

Decline in sea level

↓

Gain in erosive power

* Entrenched meanders
* Deepening of gorges and canyons
* Rapids

- **Emergent** landforms :-

* Wave cut platforms

These are seen along coastlines due to corrosion, hydraulic action and abrasion.

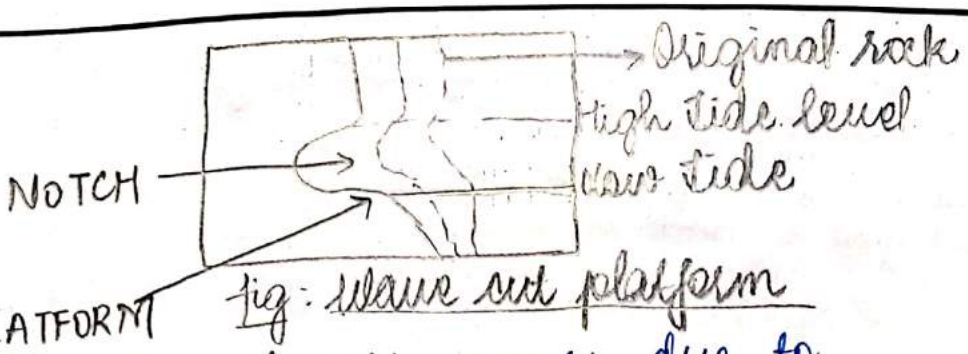

fig: Wave cut platform

* Raised beach It occurs due to decline in sea level, or raising of land.
* Wave cut arches, stacks and stumps

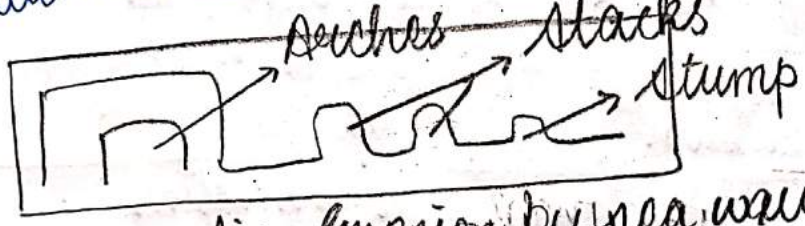

fig: Erosion by sea waves

- Submergent landforms :-
* Fjords U-shaped glacial troughs

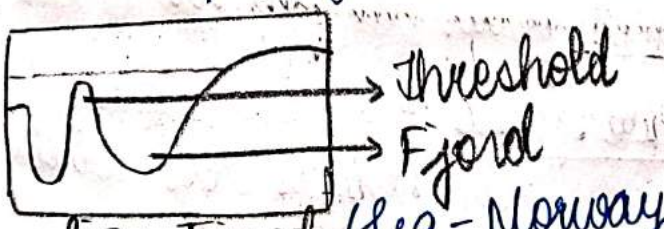

fig: Fjord (Eg- Norway)

* Ria coastline Due to submerged former river valley
* Dalmation coastline It is longitudional to ridge on coast.

12. Explain the reasons behind earthquakes in Himalayas being more intense and frequent than the ones occurring in Alps region. Why are scientists predicting a largescale earthquake in northern India? Also, elaborate upon some prominent earthquake forecasting techniques. **(250 words) 15**

आल्प्स क्षेत्र में आने वाले भूकंपों की तुलना में हिमालय में आने वाले भूकंपों के अधिक तीव्र होने और बारंबार आने के पीछे उत्तरदायी कारणों की व्याख्या कीजिए। वैज्ञानिक उत्तर भारत में उच्च तीव्रता वाले भूकंप के आने की भविष्यवाणी क्यों कर रहे हैं? साथ ही, भूकंप पूर्वानुमान संबंधी कुछ प्रमुख तकनीकों का सिवस्तार वर्णन कीजिए।

Himalayas are young fold mountains, formed by continental-continental convergence.

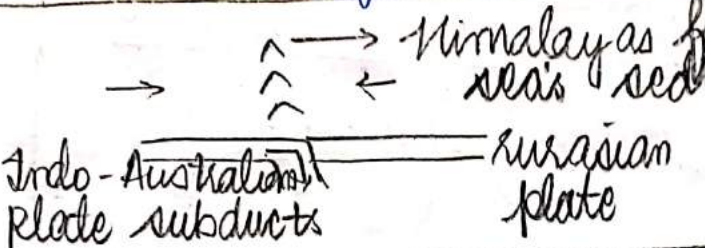

fig: Himalayas formation

Although, both Himalayas and Alps were formed during Alpine orogeny phase, but more frequent and intense quakes occur in former :-

- Faster convergence :- Himalayas are still adjusting with 5cm/yr movement, faster than Alps.
- Intensity :- Population density in Himalayas is higher, hence destruction due to tremors is more.

- Higher :- Himalayas are highest range, Hence greater pressure on tectonic plates.

- Dams :- Number of dams is more than on alps → Reservoir induced seismicity.

- Glaciers :- Himalayas have 3rd largest glacial mass after 2 poles, hence plates readjust due to glacier and water load. Decompression also occurs due to melting, causing plate movement.

⇒ Scientists are predicting a largescale earthquake post Nepal earthquake (2015) because :-

- Stress accumulated over the years will be released.
- Numerous foreshocks have been received, indicating a larger one.
- No large scale earthquake (more than 8 Richter) has occured which correlates with complex movement of Himalayas.

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⇒ Prominent forecasting methods are:-

- Sensors detecting P-S wave lag:- (developed by IIT-Roorkee)

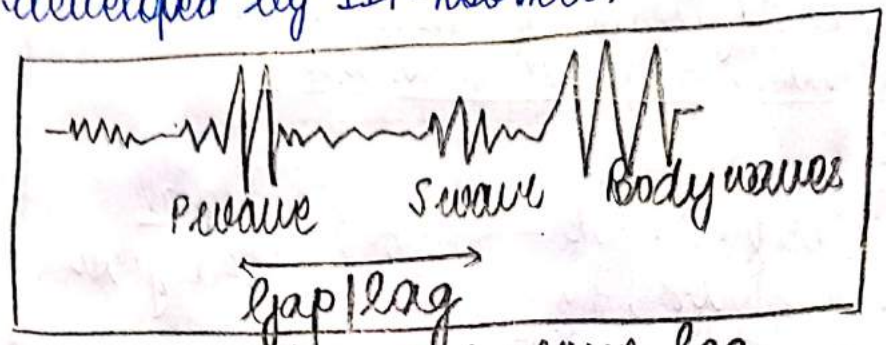

fig: P-S wave lag

It provides lead of 10 sec.-1 minute, as P waves travel at 6 km/sec and S-waves at 3 km/sec.

- Others:-
  - Increase in radon gas concentration in water.
  - Unusual behaviour of animals.
  - Foreshocks also forecast earthquake.
  - Tsunami associated with earthquake: Receding of water level; abnormal faunal behaviour eg- beaching of whales etc.

⇒ So, need of the hour is indigenous forecasting sensors, like the one installed in Pithoragarh (Italian firm Space Dynamics) and community based disaster management.

13. Explain the role of river as a geomorphic agent with suitable examples of landforms formed during its course of flow. **(250 words) 15**

नदी प्रवाह के दौरान निर्मित होने वाले भू-आकृतियों के उपयुक्त उदाहरणों सहित भू-आकृतिक कारक के रूप में नदी की भूमिका की व्याख्या कीजिए।

Rivers are exogenous geomorphic agents. The landforms may be depositional or erosional depending upon stage of course.

MECHANISM

River

Erosion
- Corrasion - [lateral, vertical]
- Hydraulic action
- Corrosion / Solvent
- Attrition

Deposition
- From high to low slope gradient
- Decrease in speed
- Carrying capacity exceeded

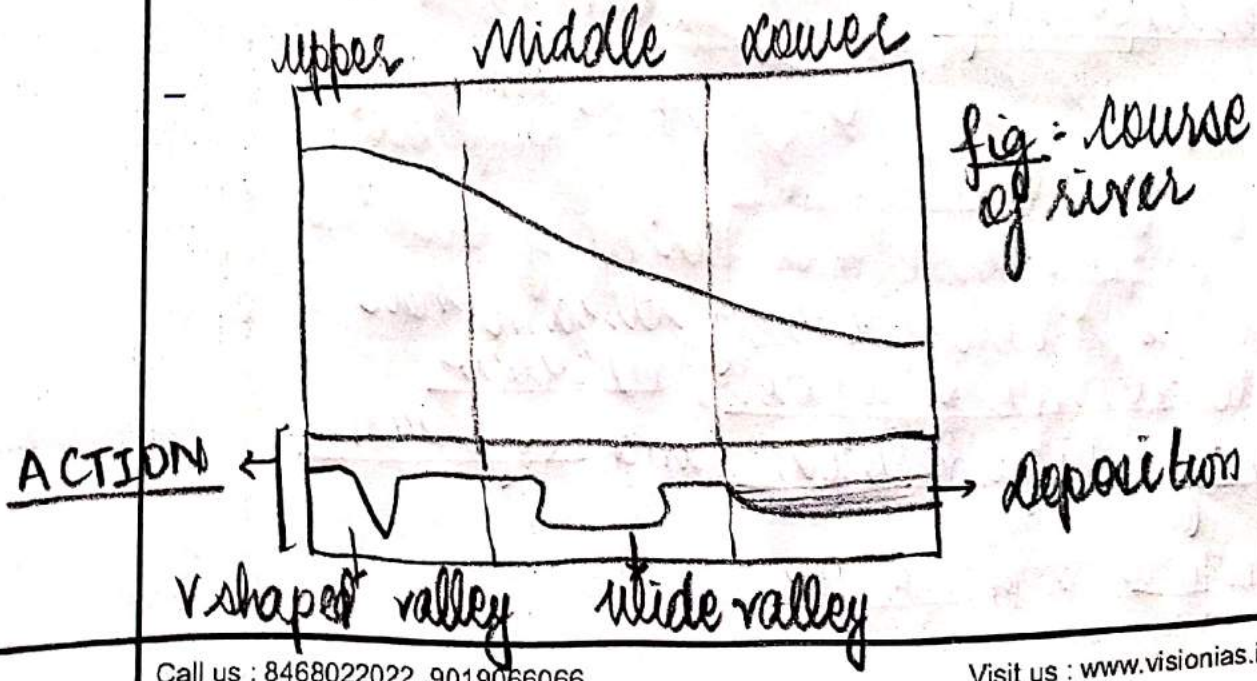

fig: course of river

→ Upper course (young stage) :-

- Cataracts and rapids

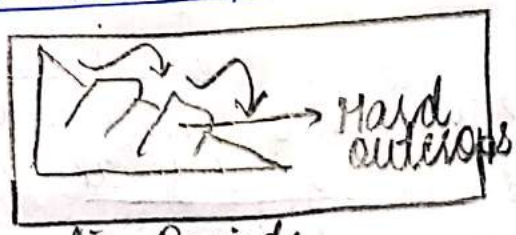

fig: Rapids

It is due to jutting out of hard rocks, which alters river flow.

- Waterfalls and plungepools

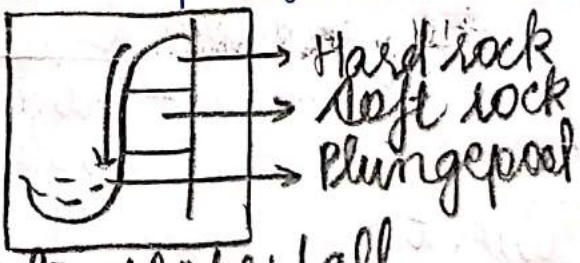

fig: Waterfall

It occurs due to sudden fall in height. Eg: Gersoppa / Jog falls (R. Sharavathi)

- Rivers capturing

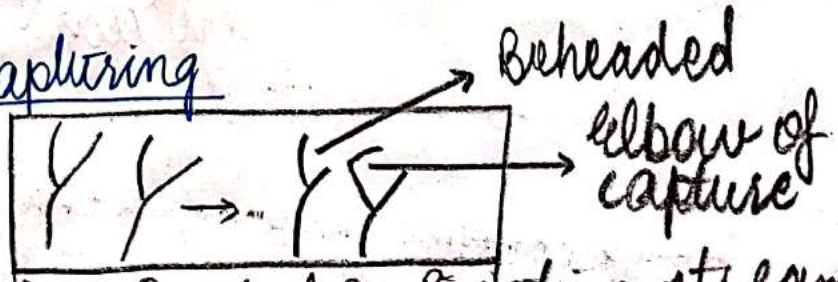

fig: Pirated & Pirating stream

It occurs when pirating stream has great volume of water, narrow valley, high velocity and soft rocks.

- Canyons and gorges

→ Middle course :-
- Interlocking spurs
- River cliffs
- Meanders Bends in River course due to erosion and deposition, on outer and inner edge (respectively).

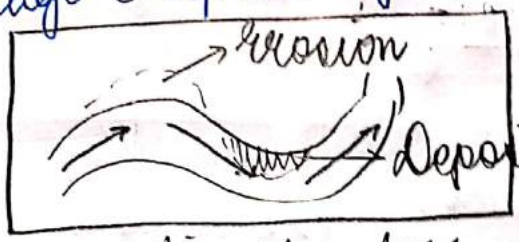

fig: Meanders

→ Lower course :-
- Flood plains : In river course
- Deltas : At river mouth
- Braided stream : Multiple channels due to deposits.
- Levees : Natural embankments formed on sides of river.
- Oxbow lake : Cut out lake / bayous

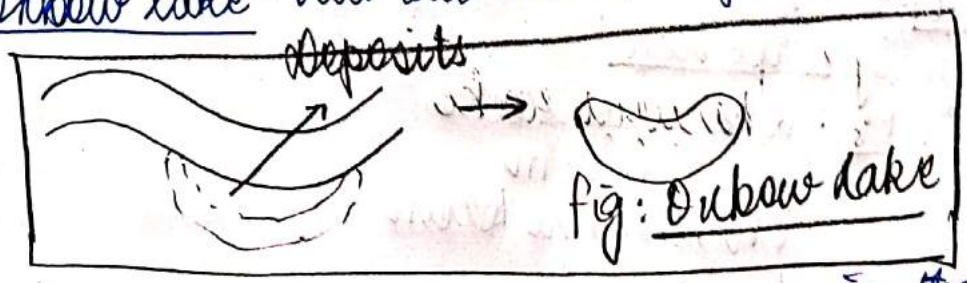

fig: Oxbow lake

⇒ Thus, running water is the most important denudational agent.

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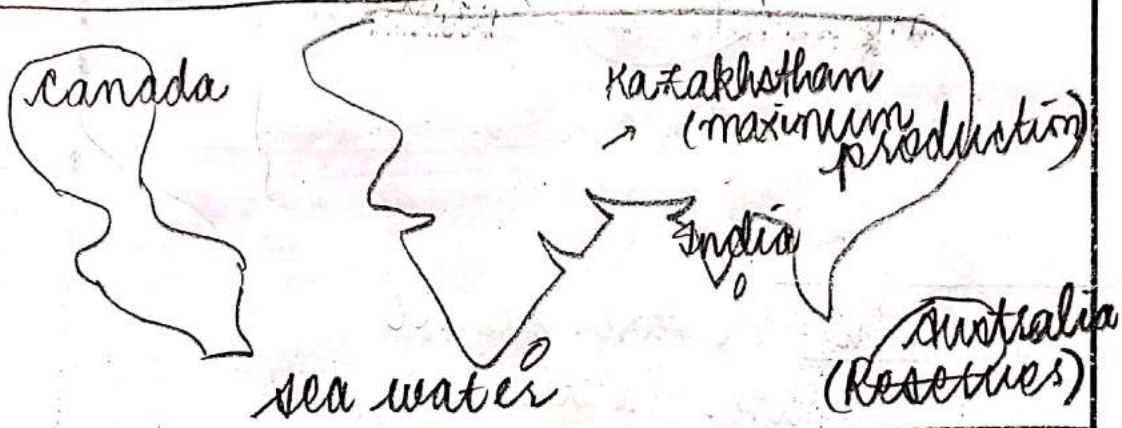
14. Identify the major Uranium reserves in the world and the countries from where India sources it. What measures are required to ensure supply security of fuel for nuclear plants in the country? (250 words) 15

विश्व के प्रमुख यूरेनियम भंडारों और उन देशों की पहचान कीजिए जहाँ से भारत इसका आयात करता है। देश में परमाणु संयंत्रों के लिए ईंधन आपूर्ति की सुरक्षा सुनिश्चित करने के लिए किन उपायों की आवश्यकता है?

Uranium is a radioactive element, found as 1-4 ppm in crust. Its major reserves are:-



- Canada: Athabasca basin
- Kazakhstan: Chu sarysu basin
- Australia: Ranger mine
  Olympic dam

- India:-
  - Majorly imported
  - Sources: Dharwar rocks
    Singhbhum
    Meghalaya Basin
    Rajasthan
    HP
    Coastal areas

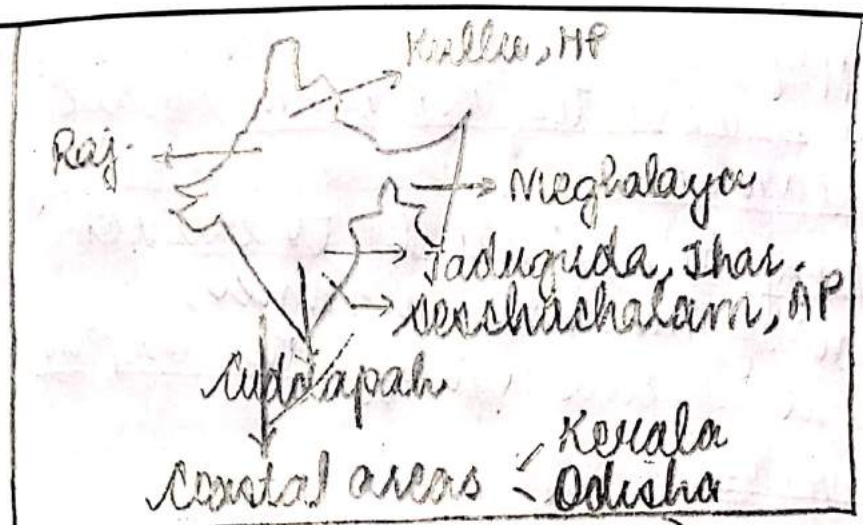


fig: Uranium (India)

⇒ India sources Uranium from :-
- Kazakhstan (maximum)
- Russia
- France

(talks with Canada and Australia)

⇒ Measures to ensure nuclear fuel security for 22 reactors :-
- Strategic uranium reserve construction like petroleum ones.
- Increase cooperation with Kazakstan and diversify trade with it.
- Balancing act with Iran and safeguard investments as it is access to Central Asia.
- Secure sea lines of trade to ensure

fuel supply.
- Tap into underwater uranium under 'Deep Ocean Mission'.
- Technology development : to extract uranium from Indian mines, which is located at greater depth in economic way.
- Diversify relations with uranium reserve countries.
- Bilateral negotiations and focussed diplomacy with NPT countries.
- Portrayal as a responsible power, in line with IAEA safeguards, and non-proliferatory.

⇒ These measures can assure clean, cheap and 24x7 supply (as base load) of nuclear energy.

15. 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. **(250 words) 15**

सीबेड माइनिंग क्या है और यह भारत के लिए क्यों महत्वपूर्ण है? सीबेड माइनिंग से जुड़ी पर्यावरणीय चुनौतियों पर प्रकाश डालिए और चर्चा कीजिए कि इनसे कैसे निपटा जा सकता है।

Seabed mining refers to extraction of minerals, mainly PMN (polymetallic nodules) from seabed.

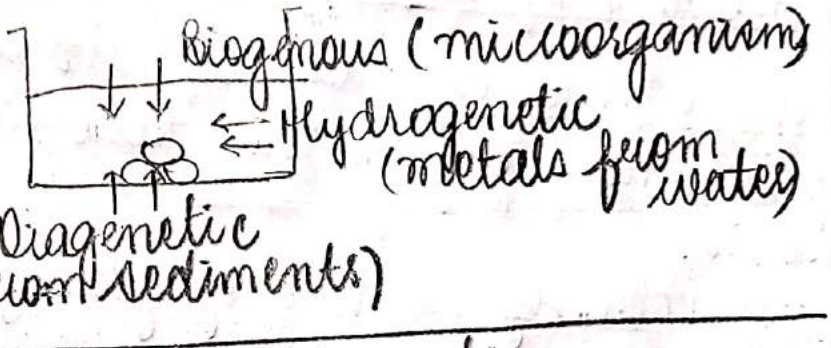


fig: PMN formation

It is significant because :-

- Rights to mine over 75000km² of CIOB (under ISA) will give thrust to 'Deep Ocean Mission' and blue economy.
- Geostrategic advantage of presence in the Indian ocean.
- Economic : Need of copper, manganese, cobalt, iron and rare earth elements (electronics).
- Trade and diplomacy : Export of Rare earths to Japan, South Korea etc.

- Environmental studies : via underwater robots and drones of GSI.
- Capacity building of Geological survey of India : Samudra Ratnakar ship for exploration.
- Exports : Forex earnings and improvement in current account.
- Coastal community : Development via employment ; Sagarmala ; Blue economy mission.
- Energy security : Mining of gas hydrates / methane clathrates
- Entrepreneurship and employment opportunities.

⇒ But, there are many environmental challenges like :-

- Disruption of marine ecosystem with equipments.
- Release of sediments will lead to water pollution.
- Machines will create noise and light pollution.
- Benthic organisms may be killed / destruction of habitat.

- Water may get contaminated due to chemicals used.
- Over exploitation can occur, without allowing it to replenish.
- Carbon sinks disruption will lead to release of GHGs.

To address these :-

⇒

- ISA (Intl. Seabed authority) can use taxes and proceeds for investing into marine ecosystem.
- Judicious excavation with minimal disruption techniques need to be formed.
- Mapping of sea bed for resources, where there can be minimum impact on biodiversity.
- Low noise and light pollution extraction methologies.
- Restoration of mined areas is important.
- New technology (like 3D printing of reefs) can be used to restore diversity.

⇒ Ultimately, as the sea bed becomes a new resource frontier, economical development needs to be aligned with SDG 14.

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16. What is Conservation Agriculture? Highlight the prospects and challenges of adopting Conservation Agriculture in India. Also, mention some important policy considerations for its promotion. **(250 words) 15**

संरक्षण कृषि क्या है? भारत में संरक्षण कृषि को अपनाने की संभावनाओं और चुनौतियों पर प्रकाश डालिए। साथ ही, इसके प्रोत्साहन के लिए कुछ महत्वपूर्ण नीतिगत उपायों का भी उल्लेख कीजिए।

Conservation agriculture is an ecologically and environmentally sustainable way of agriculture. It includes various measures such as use of mulching, no till, sustainable crop choice, crop rotation, agroforestry, organic manure, minimal soil disturbance etc.

⇒ Prospects of adoption:-

- It will enhance food security as demand for food will increase by 30% (by '30).
- It will increase productivity incrementally.
- Climate smart agriculture
- Water use effiency will save water.
- Less cost and more remunerative
- Soil health will be maintained.
- It will prevent soil erosion and runoff.
- Overall it'll be in line with Doubling Farmer Income-2022 and

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NMSA (National mission on Sustainable agriculture).

⇒ Challenges are :-
- Poor awareness amongst farmers, and paucity of extension services.
- Traditional practices like wheat-rice cycle in North India.
- Myths like tilling soil will improve productivity.
- Stubble burning resorted to, instead of mulching or using 'Happy Seeder'.
- Monocropping is usually practiced.
- Productivity may be low initially, but it improves incrementally.
- Subsidies on power, water etc. makes efforts nullified.
- Biased MSP policies hinder diversification.

→ Policies for promotion :-
- Saturation of soil health cards in all farms.
- Reward Gram Panchayats for creating model farms.

- 'Lead farmers' approach to encourage other farmers.
- MSP expansion and prioritization of drought and heat resistant crops.
- Farmers participation in on field research and technology demonstration.
- Machine banks for hiring machines (eg - Happy Seeder, laser leveller etc.)

These can help to sustain the shift from conventional to conservation agriculture, in addition to adoption of organic agriculture and Zero Budget Natural Farming (ZBNF).

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17. 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. (250 words) 15

विश्लेषण कीजिए कि भारत जैसे विकासशील देशों की चिंताओं के संबंध में पेरिस जलवायु समझौते के उद्देश्यों को प्राप्त करने में 'कैटोवाइस जलवायु पैकेज' कितना कारगर सिद्ध हुआ है।

The COP 24 of UNFCCC at Katowice has yielded a mixed bag, w.r.t. objectives of Paris agreement of :-

- Keeping global temperatures to below 2°C threshold above pre industrial level
- Increase adaptation ability and resilience
- Consistent finance flow.

The concerns of India at Katowice were :-

- Securing finances and transfer of technology for developing countries.
- CBDR-RC : Common but Differential Responsibilities - Respective capabilities
- Different starting points for developed and developing nations.

⇒ In this context, achievements of COP 24 were :-

- Rulebook : Rules for Paris agreement

were formulated successfully.

- Public Registry : INDCs of nations will be available online for transparency.
- Finances : Securing of $100Bn/yr and new financial targets from 2025.

⇒ However, it lagged behind on :-

- Omission of 'equity' : USA got reference to equity removed from rulebook.
- Double counting : No consensus on weeding out inflated numbers.
- MRV : No consensus on Monitoring, Reporting and Verification methodology.
- SR 1.5 report : It was rejected by nations like USA, Russia, Saudi Arabia etc.
- Finances : No scale up under Article 9.
- Task force on losses and damage : There was no advancement.
- The motion of whether members were doing enough was not allowed.

Hence, these concerns, especially on finance and technology still persist, which need to be solved at COP 25 (Santiago, Chile) to achieve objectives of Paris climate agreement.

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18. 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. **(250 words) 15**

भारत में मृदा प्रदूषण के लिए उत्तरदायी कारकों का परीक्षण कीजिए। विभिन्न पारिस्थितिकी तंत्र सेवाओं पर इसके प्रभाव की विवेचना करते हुए, प्रदूषित मृदा का जीर्णोद्धार करने के लिए कुछ उपचारात्मक उपायों का सुझाव दीजिए।

According to ISRO data, 30% land of India is degraded and polluted, impacting both, ecology and economy.

→ Factors behind soil pollution are -:

- Unsustainable agriculture: Excessive chemical usage; mineral imbalance; intensive farming; stubble burning.
- Waste: e waste | biomedical waste | hazardous waste etc. leaches into the soil.
- Oil spills and other hazardous chemicals (untreated effluents)
- Natural causes
  - Volcanoes
  - Forest fires
  - Seepage from sewage system
  - Meteorites
  - Natural accumulation in soil

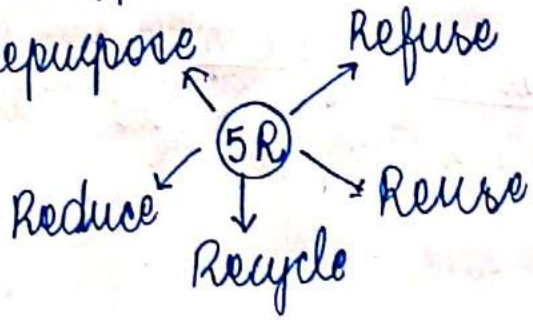
→ Impact on ecosystem services is -:

- Food insecurity : It occurs due to poor agrarian productivity, and toxicity in food, due to chemicals.
- Diseases : There occurs bioaccumulation and biomagnification.
- Water contamination : Runoff from soil, and seepage into ground water.
  According to CWC, 12 rivers of India have more than 2 toxic compounds.
- Degrade biodiversity of soil
- Destroy marine ecosystem : Runoff from soil may destroy flora and fauna in rivers; eutrophication; acidification etc.
- Corrode infrastructure : Toxic elements destroy pipes and foundations.
- Air contamination : Eg: Dioxins and furans released from plastic waste in soil.

→ Remedial measures for restoration include :-

- Bioremediation : Introduction of micro-organisms and plants (eg - castor plant) for degrading pollutants.
- Sustainable farming : adoption of conservation agriculture, vermiculture, mulching etc.
- In situ revival : Biochar and enzymes.
- Proper maintenance of sewage system.
- Scientific waste collection and management of landfills.
- 'Waste minimization circles' for small industrial clusters.

⇒ Finally, to achieve Land Degradation neutrality (LDN) by 2030 (UNCCD) and SDG-15, public awareness and 5R approach is the key.



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19. Discuss the vulnerabilities of urban areas to disasters. What measures have been taken to minimise the losses in such areas during disasters? What further improvements would you suggest to make them more resilient? **(250 words) 15**

आपदाओं के प्रति शहरी क्षेत्रों की सुभेद्यताओं पर चर्चा कीजिए। आपदाओं के दौरान ऐसे क्षेत्रों में होने वाली क्षति को न्यून करने के लिए क्या उपाय किए गए हैं? आप उन्हें और अधिक लचीला (रिज़िल्यन्ट) बनाने के लिए क्या उपाय सुझाएंगे?

'Face of Disasters' report 2019 highlights the increasing vulnerability of urban areas to disasters.

Such vulnerabilities are -:

- Heat waves : Due to global warming and heat island effect.

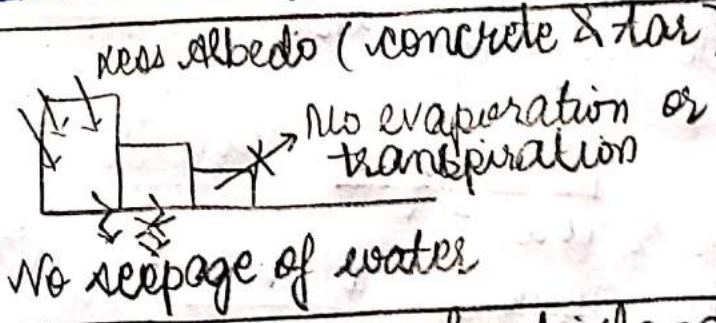

fig : Urban heat island

- Urban floods : It occurs due to increasing concretization, low seepage, and encroachment of flood plains, ponds and wetlands. Eg : Uttarakhand ; Kerala.
- Industrial and chemical : Due to factories in urban and periurban areas ; unorganized sector, etc.
- Urban fires : It is due to faulty construction, illegal land use and lack of safety audits.

margin (इस भाग में कुछ ना लिखें)

eg: Recent Surat coaching centre fire

- Earthquakes : Vulnerability is multiplied due to high population density and haphazard urbanization.
- Terrorist attack : Urban terrorism is preferred due to instant media coverage, sleeper cells, anonymity, easy recruitment and critical infrastructure damage.
- Others : Infectious diseases (Nipah virus, JE virus)
  Sea level rise
  Desertification, etc.

→ Measures taken to decrease losses are :-

- City disaster management plans and SOP formation by ULBs.
- DDMA : District Disaster management authority is the nodal body coordinating guidelines of NDMA and SDMA.
- Structural measures
  - Building codes
  - Land use plans
  - Fire safety equipments ; exits etc.
  - Retrofitting
  - Earthquake resilient buildings

- Non structural measures:-
  - Capacity building of police and fire services
  - Fire safety audits
  - Early warning systems
  - Mock drills
  - Awareness generation by involvement of NGOs, schools & colleges etc.
  - Action plans.

Eg: Ahmedabad heat wave action plan

→ For increasing resilience, improvements can be:-

- No knee jerk reactions, but apply concept of 'Build Back Better'
  Eg: Post floods, desiltation of all water bodies.
- International best practices adoption.
  Eg: China's sponge cities
- Formulation of Urban Risk assessment framework with participation of civil society and experts
- Special mitigation plan for migrants (most vulnerable)

⇒ It should further be supplemented by a credible financial framework to disaster proof cities.

20. What is Community Based Disaster Management (CBDM)? Highlight its main principles, features and significance for resilient disaster preparedness in India. **(250 words) 15**

समुदाय आधारित आपदा प्रबंधन (CBDM) क्या है? भारत में लचीली (रिज़िल्यन्ट) आपदा तैयारियों हेतु इसके मुख्य सिद्धांतों, विशेषताओं और महत्व पर प्रकाश डालिए।

According to UNISDR community preparedness reduces disaster impact, especially number of lives lost.

Principles of CBDM are:-

- Decentralized disaster management is the key.
- Community involvement to form risk assessment framework and disaster reduction plan
- Participatory monitoring and evaluation.
- Focus is especially on vulnerable groups like SC, ST, senior citizens, children and animals.
- Formation of DMC (Disaster management committee) with all stakeholders:-

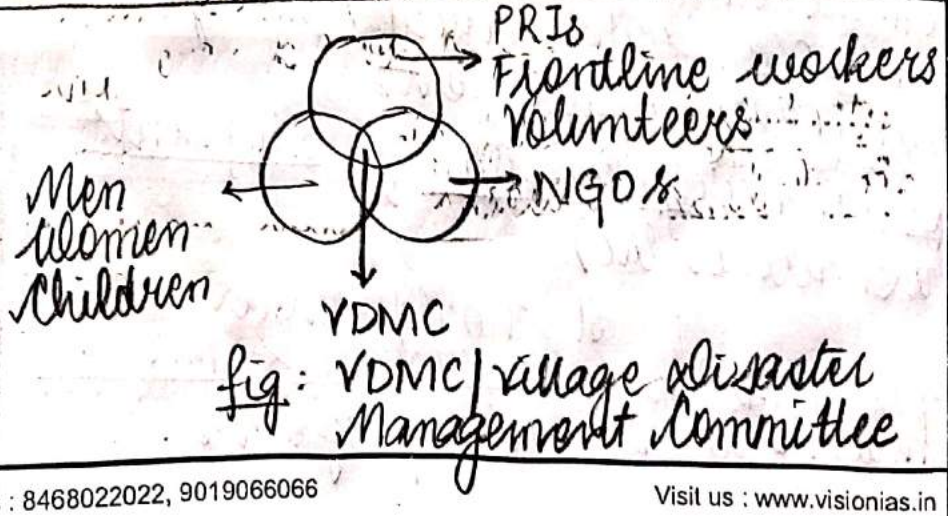

fig: VDMC | Village Disaster Management Committee

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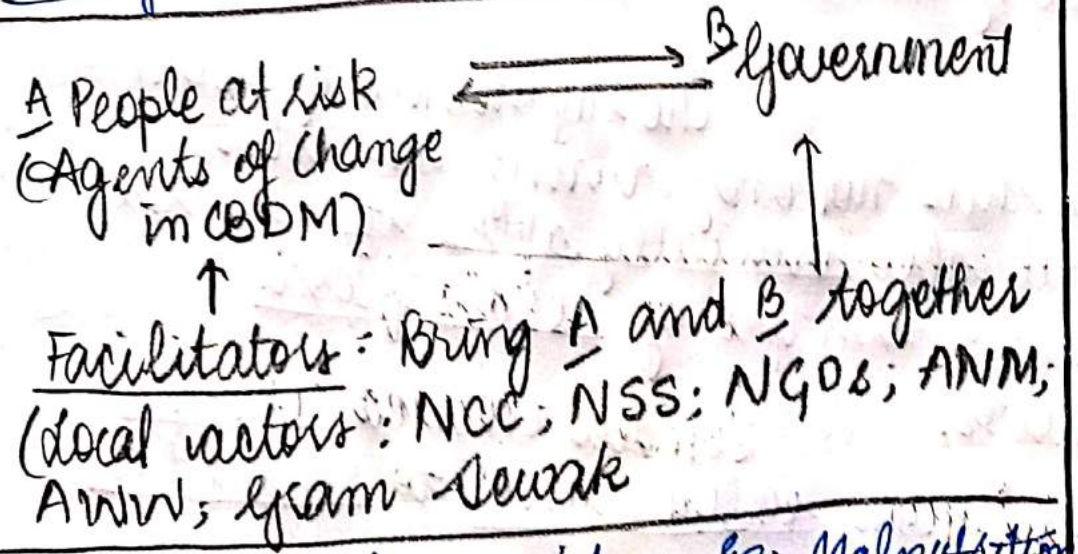
Main features of CBDM :-

- Responsibility is entrusted to local bodies.
- HVRA - Hazard, vulnerability and risk assessment is done first.
- It is followed by resource mapping (inventory).
- Risk reduction planning and EWS is established.
- Post disaster, monitoring and evaluation, and relief is provided.
- Capacity building is done with mock drills, awareness in schools, colleges, society etc.
- Involvement of NGOs and other civil society actors as facilitators.



- address underlying risks : Eg: Malnutrition in children

Significance of CBDM:-

- Community is first responder.
- Aid in first hour / golden hour is the most precious to save lives.
- Resources and relief can be better distributed.
- Psychosocial rehabilitation can be done by society only, as the people know each other's economic status pre-disaster.
- To 'build back better', cooperation of society is required. Eg - Retrofitting of homes.
- Use of traditional knowledge and skills.

⇒ The importance of CBDM is thus not only during disaster, but also crucially after it, as the recent example of Kerala floods shows. Females weaved 'Chekutty dolls' from soiled sarees to rehabilitate post disaster.