



An Institute for Civil Services

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RISHENDRA SINGH

AIR 113

CSE 2023

GEOGRAPHY



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GS SCORE

Geography Test Series 2023

TEST - 05

GEOGRAPHY

Time Allowed: 3 Hrs.

Max. Marks: 250

Instructions to Candidate

- There are FIVE questions. All Questions are compulsory.
- 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.
- Word limit in questions, wherever specified, should be adhered to.
- Attempts of questions shall be counted in chronological order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the answer book must be clearly struck off.

106

Good!

1. Invigilator's Signature _____

2. Invigilator's Signature _____

Name RISHENDRA SINGH

Mobile No. _____

Date _____

Signature Rishendra

Dear Rishendra,

I have found your content is good and as per the demand of questions mostly. However try to avoid writing in margins otherwise it will lead to penalty marks in exams.

* you did good attempt.

All the best!
Keep it up!

* Try to include case studies specially in human geography & contemporary questions.

IP BES

GEOGRAPHY

Max. Marks: 250

Time Allowed: 3 Hrs.

1. Write short notes on the following in about 150 words:

- (a) Explain the unique features and ecological significance of the Thar Desert in India. (10 Marks)
- (b) Discuss the role of India's geographical location in determining its diplomatic engagements with neighbouring countries. (10 Marks)
- (c) Discuss the role of climate change in exacerbating the frequency and intensity of floods and droughts in India. (10 Marks)
- (d) Discuss the role of national parks in preserving and promoting biodiversity in India. (10 Marks)
- (e) Discuss the concept of energy crisis and its implications for economic development in India. (10 Marks)

2. Attempt all the questions:

- (a) Evaluate the role of the Indian Ocean, Himalayan mountains, and Tibetan Plateau in influencing the behaviour of the monsoon system. (15 Marks)
- (b) Analyse the factors that influence the occurrence and intensity of tropical cyclones in the Bay of Bengal and the Arabian Sea. (15 Marks)
- (c) Compare and contrast the characteristics of alluvial soils and red soils in India, including their fertility, agricultural productivity, and distribution. (20 Marks)

3. Attempt all the questions:

- (a) Compare and contrast the characteristics of the Western Ghats and the Eastern Ghats, highlighting their significance in regional development. (15 Marks)
- (b) Discuss the unique features and challenges associated with the arid and semi-arid climatic regions of India. (15 Marks)
- (c) Analyse the distribution and potential of marine resources in India, including fisheries, coastal ecosystems, and offshore oil and gas reserves. (20 Marks)

4. Write short notes on the following in about 150 words:

- (a) Discuss the challenges and opportunities associated with the management and conservation of soil resources in India. (10 Marks)
- (b) Explain the concept of watersheds and their role in the management of water resources. (10 Marks)

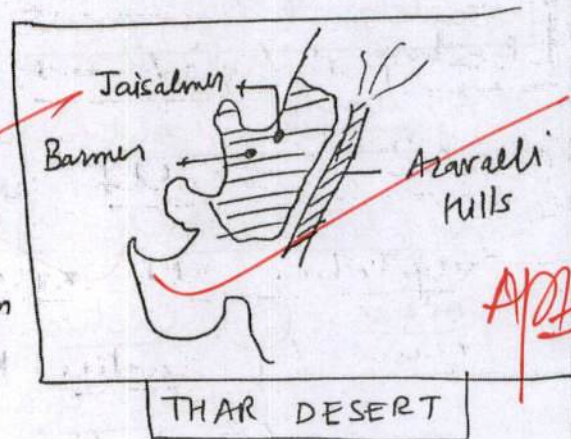
- (c) Discuss the socio-economic implications of climatic variations across different regions of India. (10 Marks)
- (d) Analyse the factors influencing the formation and characteristics of different soil types in India. (10 Marks)
- (e) Evaluate the influence of altitude and topography on the formation of the alpine and sub-alpine climatic regions in India. (10 Marks)
5. Attempt all the questions:
- (a) Discuss the distribution and availability of surface and groundwater resources in different regions of India. (15 Marks)
- (b) Compare and contrast the characteristics and significance of agricultural land, forest land, and urban land in India's land resource management. (15 Marks)
- (c) Discuss the role of monsoon forecasting and early warning systems in mitigating the socio-economic impacts of monsoon-related disasters. (20 Marks)



1. (a) Explain the unique features and ecological significance of the Thar Desert in India. (150 Words) (10)

"Thar Desert" or the "Great Indian Desert" is the western extreme of Indian peninsular region which is sandy in nature (erg type).

Location: Lies in Western Rajasthan and Northern part of Gujarat along with Western Haryana & Southern Punjab



Unique features :

- 1) Consists of various depositional landforms
(eg) Barchans, Longitudinal dunes
- 2) Northern extent of Desert has 4 important saline lakes i.e. Sambhar, Sidwana, Kutchman, Sigra
- 3) Geologically its a part of Peninsular India but geographically a part of Indo-gangetic

Remarks

* Ephemeral salt flats (Playas)

Plan

4) Important river draining the desert is Luni. (Lifeline of Thar)

5) Numerous tribes live in desert (eg) Maldhari (N. migrat)

Ecological Significance

1. ^{locally} ~~faunal~~ wealth is discrete. Only arid vegetation with xyrophytic modifications occur. (eg) Cactus, Khejri, Bulbul.
(Thick Stem, Absent Leaves)

2) faunal wealth \Rightarrow Camels (Ship of Deserts) and Nightlife vivid (Nocturnal)

3) Dryzone agriculture proceeds through irrigation.
(eg) Indus Gandhi Canal from Harik

4) Rainfall is less than 40cm (Parallel to Saurashtra)

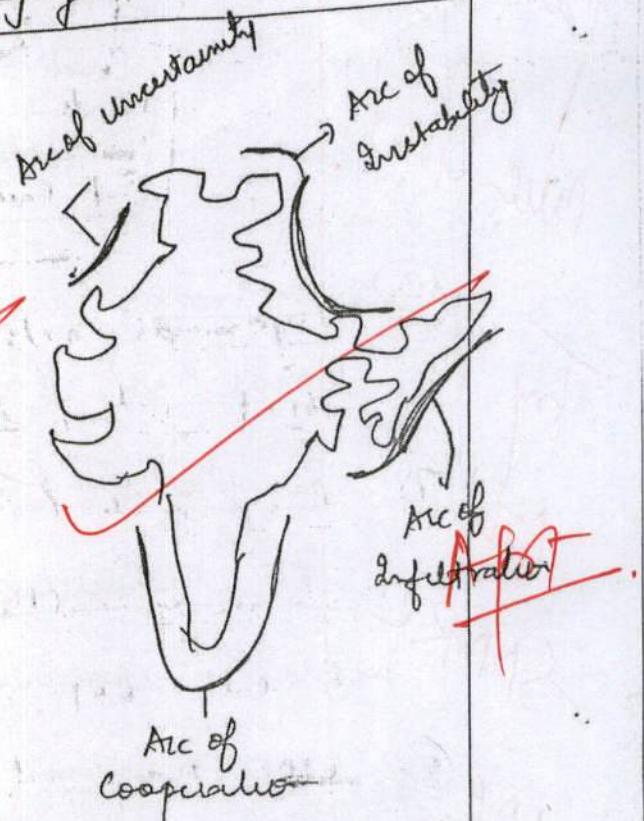
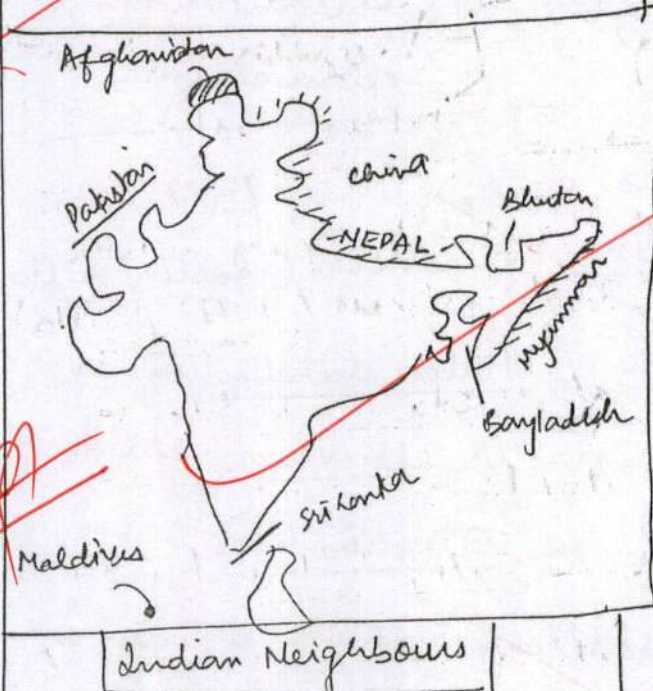
Recent eastward expansion is a threat to geographical stability. Mineral Rich zones of Khetri (Copper) and Manganese need more research

Remarks

4

1. (b) Discuss the role of India's geographical location in determining its diplomatic engagements with neighbouring countries. (150 Words) (10)

India is a geographically vivid nation which parts the feature of larger Indian Subcontinent. Such vivid geography (fig 1) helps India in creating deeper diplomatic engagement with the neighbours.



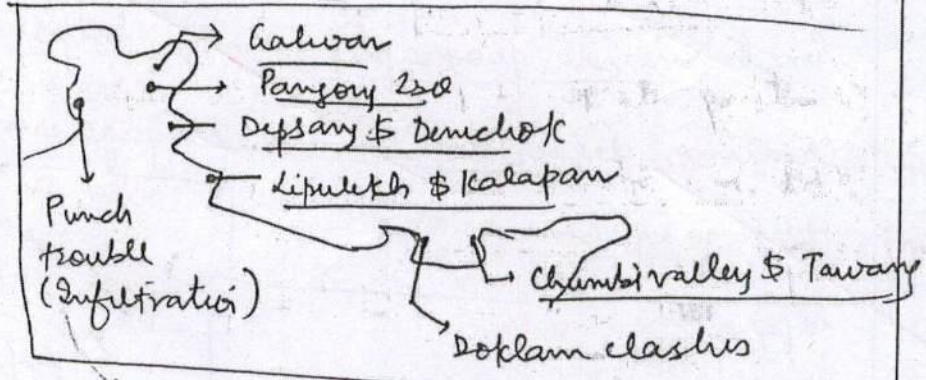
Role of Geography determining diplomatic engagements

1. Northern & North eastern Mountain - Creation of Buffer zones and frequent clashes over land

Remarks

Issues with ^(LAC) China, Nepal and Bhutan

- ② NW Mountains and Plains of Panyanad - Increased uncertainty to relations with Pakistan due to terror infiltration along LOC



- ③ Myanmar acts as an opportunity for Indian Look East & Act East policies (Rolling hills)

- ④ Bangladesh (Zone of Malda subduction) is rich in agriculture due to alluvium which promotes cooperation in Textiles & SHG's.

- ⑤ 6100 Maritime coastline initials engagement with Indian Ocean Region through SAGAR policy

- ⑥ A&N Islands also boost Act East due to just 175 km distance from Sumatra

Thus Indian geography determines India's engagement

Remarks and role to become VISHWAGURU.

Avoid writing beyond Margins

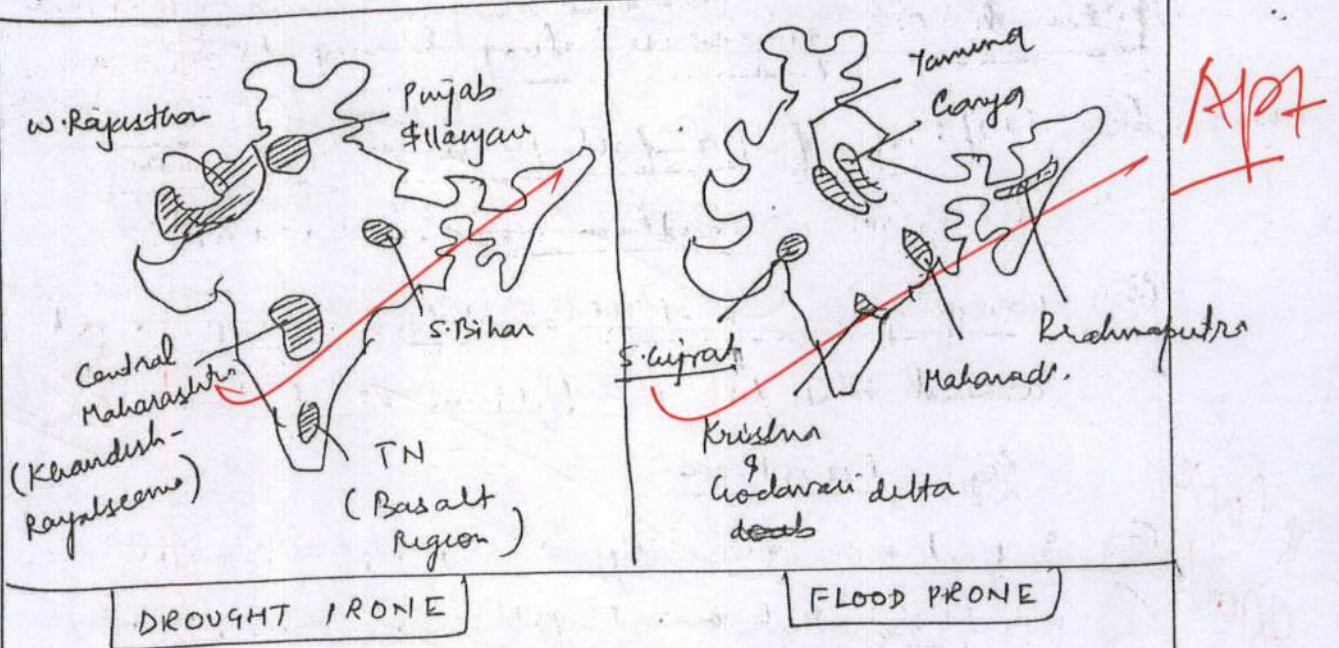
Provide
Better conclusion

3.5

1. (c) Discuss the role of climate change in exacerbating the frequency and intensity of floods and droughts in India. (150 Words) (10)

Good

IPEC's 6th Assessment Report highlights that any breach of 1.5°C will have immense regional impacts on Himalayan and monsoon dependent nations along ocean extents. India, too, reels under the risk due to increasing intensity of floods & droughts.



Climatic influence on floods

1. Increasing moisture holding capacity of air parcel leading to intense rainfall of short periods.

Remarks

Include Case Studies

- (eg) flash floods in channels.
- (2) Rising sea level due to melting of Arctic ice and increased precipitation of S-W monsoon.
- (eg) seawater entering Mumbai \Rightarrow Mumbai flash floods
- (3) Increased intensity of cloud bursts and prolonged rainfall over deficit region
- (eg) Delhi & Chandigarh (Punjab flash floods)

Climate Change exacerbating Droughts

- (1) Shifting of Rainfall patterns (eg) Bihar droughts in southern region (Ferozpur)
- (2) Orographic rainfall \Rightarrow deficient regions get denied due to rainfall in W. Ghats
- (eg) Rajasthan.

- (3) Impact on already drought prone areas
- (eg) (Khondish \leftrightarrow Rajalseema exacerbated)

India suffers from this unique malice that at the same season, a part suffers from flooding whereas other from drought. This will only intensify due to climate change. Thus to reduce pain, govts must

Remarks

question the implementation of River linking projects to reduce impact

4

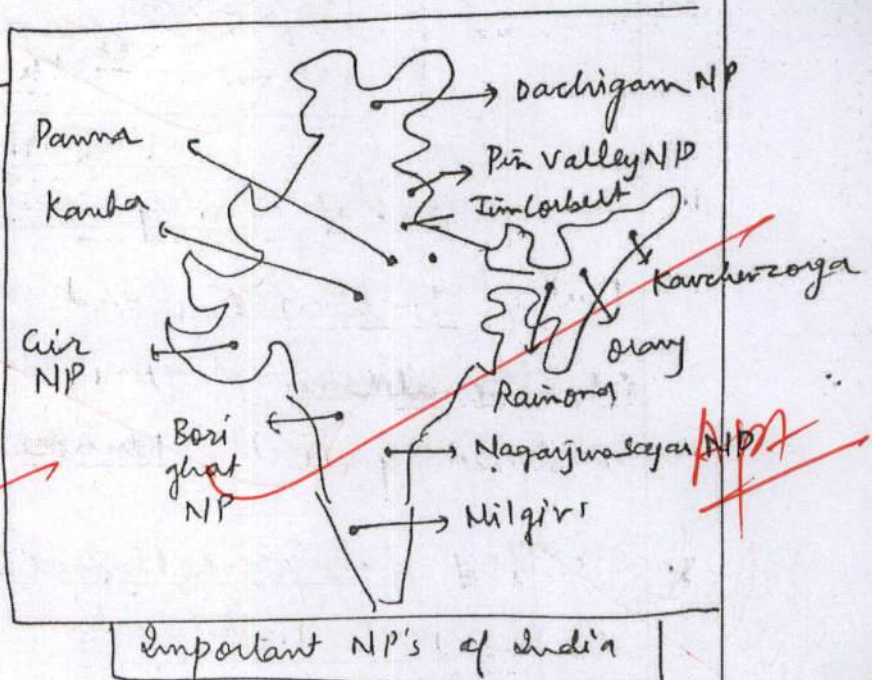
Avoid

1. (d) Discuss the role of national parks, in preserving and promoting biodiversity in India. (150 Words) (10)

Wildlife Protection Act - 1972 leads to the creation of protected areas, among which the most stringent protection norms are applied on "National parks" due to their biodiversity rich habitat.

Role of N.P. in Preserving Biodiversity

- ① A zone of no human interference.
- ② Create rich pop. of keystone species.
- ③ Panna NP & Air NP (Tigers) (Lion)



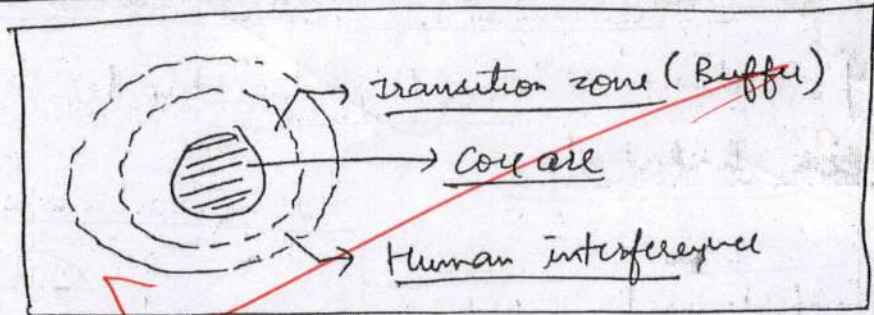
- ④ Reintroduce new species. (e.g.) Chital in Kuno Palpur NP (MP) — Good
- ⑤ Preservation of real original habitat of the species.
- ⑥ Making the zone agriculture free and increasing natural faunal diversity along with floral species.

Remarks

⑦ Creation of Interlinking between different NP's to boost habitat

(e) Tiger & Elephant corridors

Role of NP's in promoting Biodiversity



Structure of NP's

1. Introduction of New species. (eg) Cheetah translocation
2. Making poaching free and open scrubland for the conserved species. (eg) Hangul translocation Dachigam Rhinoceros in Kaziranga and Orang NP)
3. Zone of experimentation. (eg) Vulture food parks to boost Biodiversity in Maryana's NP's
4. Introducing adequate preybase for sufficient prevention from extinction.

India possess 4 of the 52 Biodiversity hotspots of the world and NP's form an important aspect for promoting a Biodiversity rich zone in India.

Remarks

Good Answer

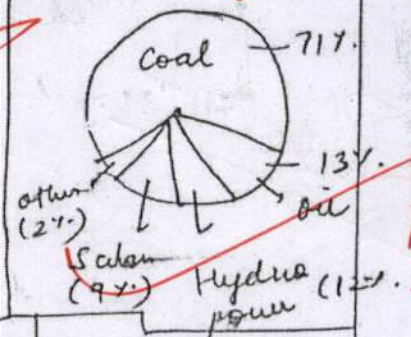
(5)

2.

1. (e) Discuss the concept of energy crisis and its implications for economic development, in India. (150 Words) (10)

Energy crisis is said to occur when the demand for the energy requirement far exceeds the supply from National grid.

Valid Case Study: India's coal deficiency during last monsoon highlighted India's precarious situation when it was left with 20 months storage only.



Concept of Energy Crisis

1. Excessive dependence on one (one) source of energy. (coal)
2. High dependence on import rather self sufficiency (e.g. 75% coal & 92% oil imported)
3. Nascent stage of other energy resources
 - (5) Solar, wind & Mini power plants (Hybrid & Coproduction) plants
4. Excessive short period of demand highlights the crisis. (and perpetuates it)

Remarks

Implications for economic development in India

1. Agricultural Backwardness - Collapse, as 79% of irrigation facilities are powered by grid based on coal power plants (Thermal plants)
2. Industrial Laggardness - since energy forms the 'building bloc' of Industrial & Manufacturing development. (25% contribution would downgrade to 12% due to Energy Crisis (IEA))
3. Service sector would totally collapse due to 100% dependence on electricity
4. Exacerbate Rural-Urban divide - Rural electrification miss would impact social upliftment too
5. Gender divide would increase (Women-burdened for traditional source)
(5) firewood

Initiatives for development of Geothermal, Wind, OTEC, Wave, Thermal plants (Biogas) should be promoted. Increasing R&D to 2% (global avg) from current 0.6% (meagre) would be a step forward in right direction.

Remarks

G.S

Avoid

2. (a) Evaluate the role of the Indian Ocean, Himalayan mountains, and Tibetan Plateau in influencing the behaviour of the monsoon system. (200 Words) (15)

Seasonal reversal of winds i.e. Monsoon which is North-east in Summers & South-west in Winters.
Summers is largely depended upon 3 basic geographical features i.e. Indian Ocean, Himalayas & Tibetan plateau.

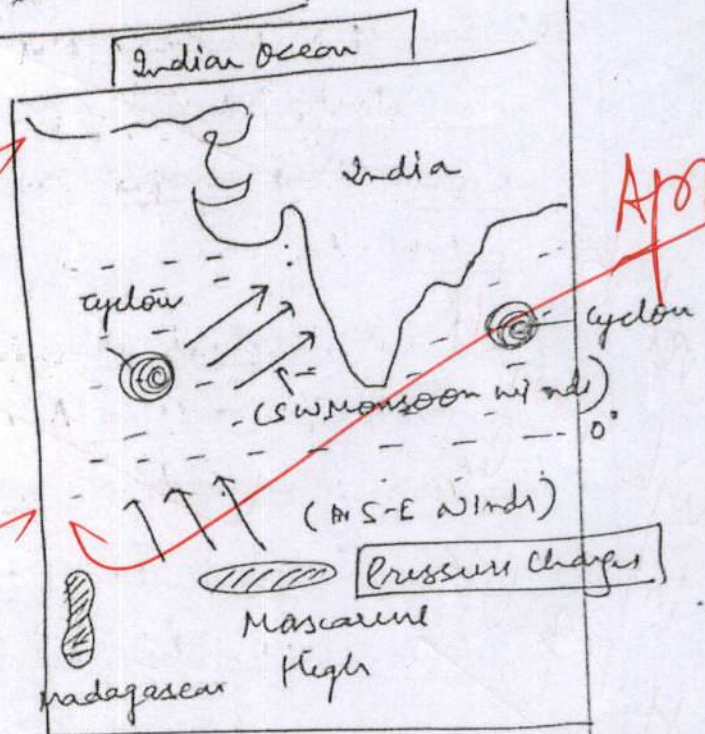
(i) Role of Indian Ocean in Monsoon

- (a) Create pressure gradient due to high specific heat capacity of water vs land.

Ocean \Rightarrow LP in Winters
 \Rightarrow HP in Summers

- (b) Provide abundance of moisture for the S-E winds having high moisture holding capacity.

- (c) Presence of islands in oceans leads to intensification of LP (Warm core cyclone) and HP (Cold core anticyclone) over the ocean.



Remarks

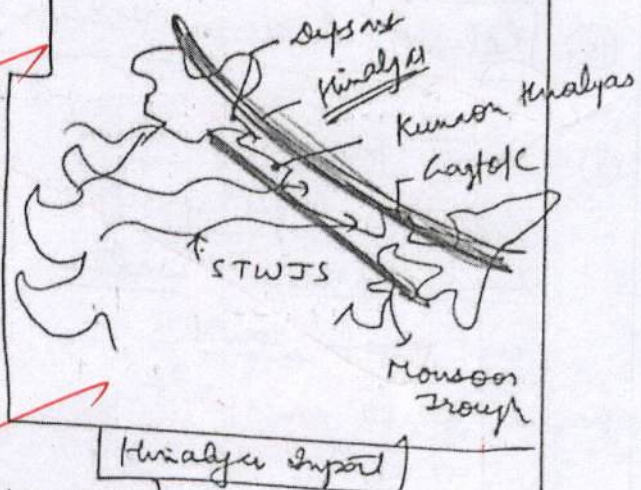
Valid

④ Leads to formation of tropical cyclones & depression which impacts the even distribution in central India & burst after long breaks in monsoon.

⑤ Recent Biparjaya ⇒ led to accumulation of moister laden winds along west coast & then sudden burst after depression.

② Role of Himalayan Mountains in Monsoon

① Trap the sub tropical Westerly Jet Stream and halt the monsoon burst.



② Arrest cold powerful winds from N-E Asia to enter India (N-E Monsoon)

③ Creates the trail of Monsoon trough along its shivalik edges ⇒ leading to immense Rainfall in Trai Region ⇒ Floods in Kori & Alapra & Arabak & Rapti during Monsoon.
(Southern Trail dips in Indian Ocean making the tropical depressions enter India)

Remarks

Through River moult

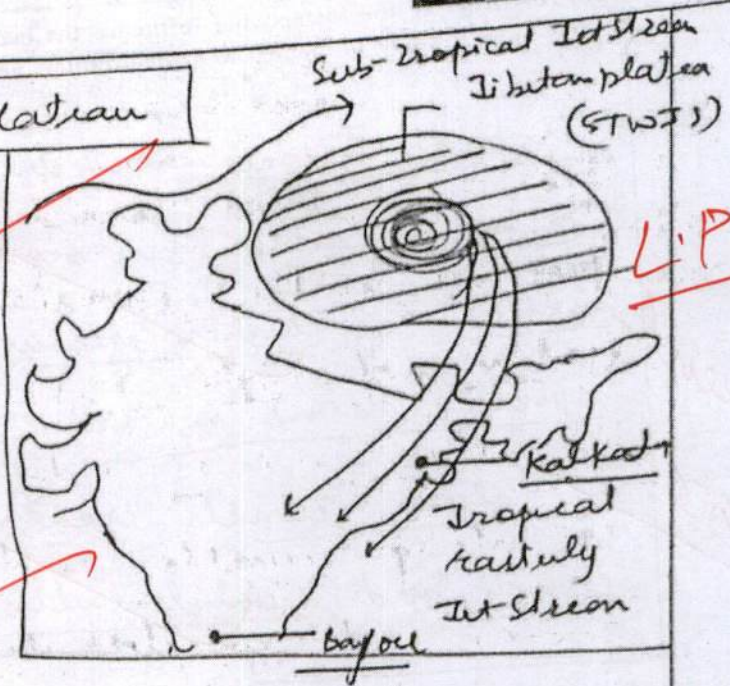
③ Role of Tibetan Plateau

① Northward shift of STWJS lead to burst of monsoon in India (June 1-10)

② Tropical easterly Jet stream lead to steering of Tropical depressions in India...

(formed due to melting of snow over Tibet and Warm Core Anticyclone in middle Troposphere)

③ Create intense pressure gradient during the peak summer months due to their altitude.
(Intense LP) \Rightarrow steering S-W Monsoon winds onshore



Thus, it is well seen that Indian Monsoon is a complex interplay of various phenomena influenced by geographical & relief features surrounding it.

Remarks

7

Good

2. (b) Analyse the factors that influence the occurrence and intensity of tropical cyclones in the Bay of Bengal and the Arabian Sea. (200 Words) (15)

Decent Start
Tropical Cyclones according to IMD are low pressure centre surrounded by increasing isolars of higher pressure causing winds to spirally move inwards and rise near the eye along eyewalls creating spiral (galaxy) like clouds and cumulonimbus Rainfall

Factors influencing occurrence of Cyclones in India

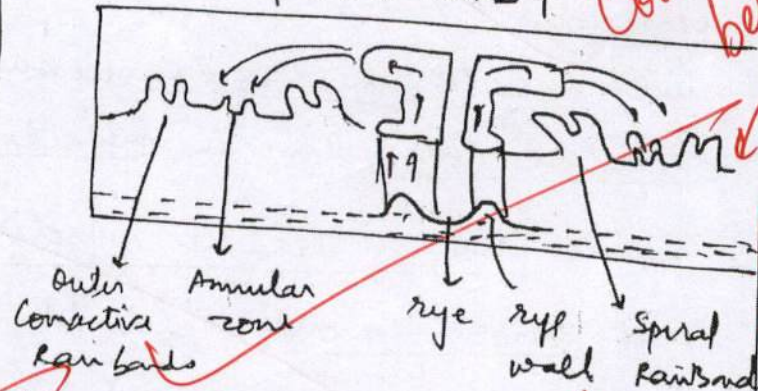
*) Since India is surrounded by oceans on both sides and lies in Tropical region thus frequency & intensity of cyclones is very high
Factors include :

1. High sea surface Temperature ($27^{\circ}\text{C} +$)
2. Upper air divergence

Remarks

(i.e. Low pressure Anticyclone at top)

STRUCTURE



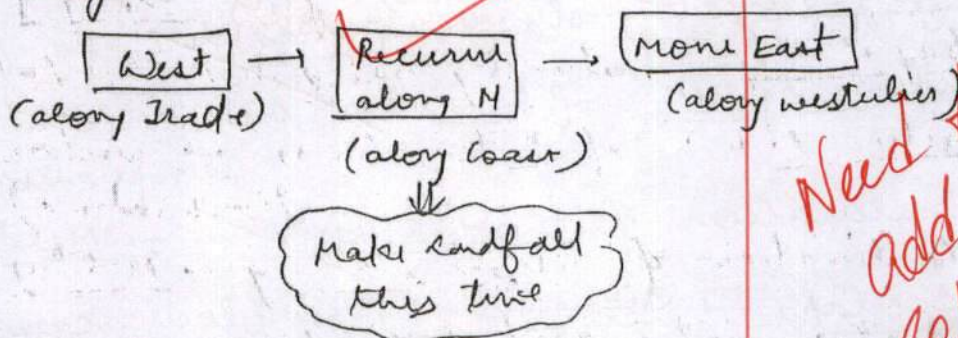
3. Steep pressure gradients
 4. Coriolis force must be present
 5. Low or absent vertical wind shear
- If these factors are present, cyclone is created.

Valid

Variation in occurrence in Indian oceans

Occurrence:

- *) Cyclonic activity happens more in Bay of Bengal than Arabian Sea (3-4 depressions per month vs 1-2 depressions per month)
- *) Intensity of cyclones in BoB is more than Arabian Sea
- *) Direction of cyclone is conducive in Bay of Bengal to enter into the land (Make landfall)



Reasons for variation:

1. High sea surface temperature in Bay of Bengal
2. Greater land mass hit index due to direction of cyclones
3. Stored in by the monsoon trough which is tilted in Indian Ocean (one end dips in Indian Ocean)

Remarks

Need to add 2 separate

one for Arabian Sea
one for B.O.B.
cyclones.

Recent changes in occurrence & intensity

1. Increased warming of Indian ocean due to climate change. ('Global BOILING' - Antonio Arretes)
2. ~~the~~ Positive IOD impacting the monsoonal intensity more

Could mention
boiling

⇒ leading to increase in frequency & intensity of Indian sea cyclone.

3. Bay of Bengal naturally cooled due to falling Eastern Rivers of India (less sea surface temperature)
 (Add both cyclone Amphan & Bipairay)

4. Combination of global warming → melting of ice caps → increased river flow causing changes in cyclonic phenomena.

cyclones forms an important climatic event in India causing harm via sea surge, gusty winds and flooding in coastal areas. (Modified)

such as traps for prevention & data gathering via satellites (NISAR) should create mitigation & adaptation strategies.

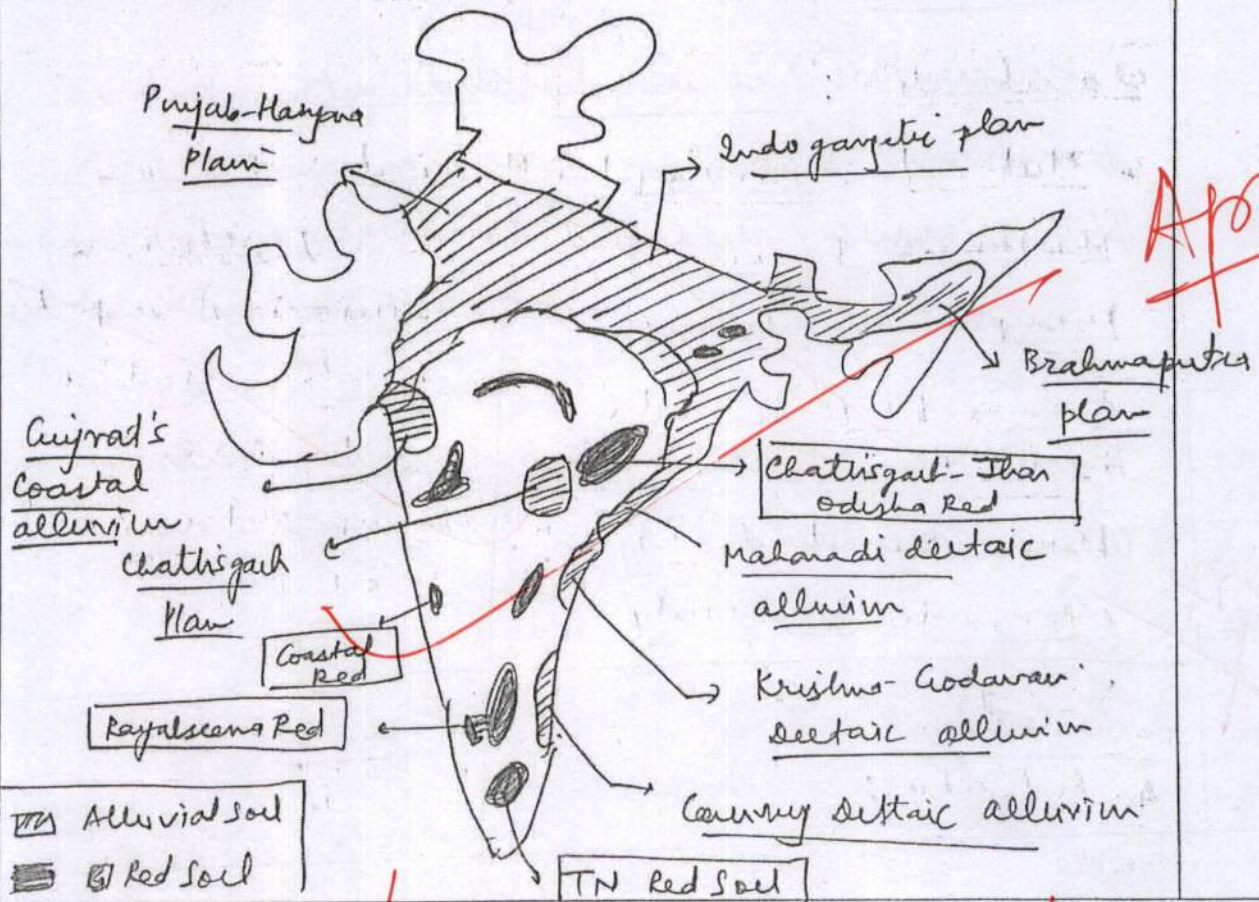
Remarks

6.5

2. (c) Compare and contrast the characteristics of alluvial soils and red soils in India, including their fertility, agricultural productivity, and distribution. (250 Words) (20)

Indian Soils form a lifeline for the agriculturally based Indian economic set up. 2 of the most dominant soil in India are Alluvial Soil (Vertisols) and Red Soils (Histosols) which significantly impact Indian lifestyle.

Occurrence



Remarks

Good but try to write a brief para on distribution also.

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Alluvial SoilOccurrence:1. 3 types of alluvial soil

- Riverine Alluvium
- Deltaic Alluvium
- Coastal Alluvium

2. Most fertile soil of India covering about 45% of areaCharacteristics:3. Nutrients: Rich in potash ~~phosphorous~~ & poor in phosphorous. Nitrogen ~~humus~~ & organic matter is found..Have characteristic lightish colour due to newly embryonic soil4. Fertility:Red SoilOccurrence:1. Mostly found along the edges of peninsular plateau and along Chattargarh - Thakhard-Odisha ~~trijunction~~2. Covers about 13% of total area with little fertilityNutrients: Rich in Iron and alluvium (sesquioxides) impart red colour to the spread. Poor in humus, Nitrogen and phosphorous5. Fertility:

Remarks

Spread in characteristic
two components

- Khadar - fertile soil
- Bhangar poorly fertile
soil

Khadar has new
alluvium deposits &
contains fresh silt &
clay whereas Bhangar
is old alluvium with
calcareous nodules..

Red soils are poor in
fertility due to bases
leaching down with
soil water. (Silicification)

But application of lime
can boost the fertility
of soil.

These soils along the
limestone rich margins
of Charkhand are
intensely fertile..

Agricultural productivity

1. Most cultivated soil
in India
2. Silt rich Northern
alluvium is suited
for wheat cultivation
whereas loam rich southern
sandy soil is intensively
put to paddy cultivation

Agricultural Productivity

1. Third most cultivated
(after alluvial & Black)
2. Cashew is cultivated
along southern margins
due to salinity & Red
Soil mixing near
Rayalseema region
3. Other cultivated species
are - Maize, Millet

Remarks

Appropriate
Analysis

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other uses:

These soils are used for house base material along Northen. plains due to their absorbing & settling capability

Other uses:

These soils are mostly used for construction purposes.

Bricks and walls of red brick are used in Maharashtra's North (Khandwa, Burhanpur, Jalgaon)

Threat to soils of India

Alluvial Soil

- Put to excessive cultivation
- Use of fertilisers to promote yield
- Practice of monocropping reducing nutrients
- Soil Mining in North UP

Red Soil

- excessive lime application
- Use of Mining along Northen Margins of Jalgaon
- Use of fertilisers to increase nutrient

excessive dependence on India's soil could be deleterious for longer productive cropping season. Efforts like organic farming & Zero Budgeted Natural farming should be promoted to allow soils to regrow to its original potential.

Remarks

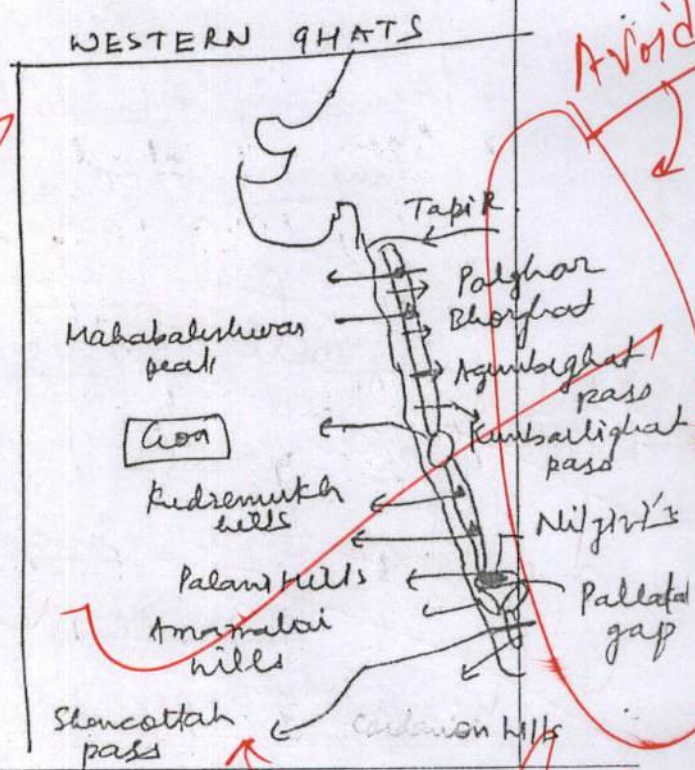
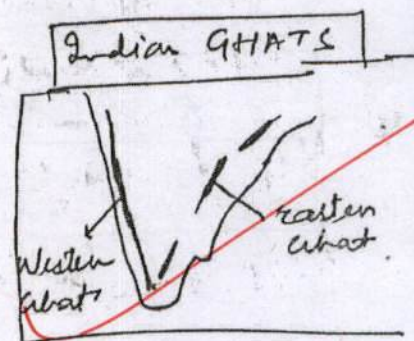
8.5

3. (a) Compare and contrast the characteristics of the Western Ghats and the Eastern Ghats, highlighting their significance in regional development. (200 Words) (15)

Indian peninsular plateau is flanked two different structured mountain hill ranges with varied relief features along the western and eastern margins shadowing India from Arabic Sea & Bay of Bengal.

* Western Ghats

- Situated between Tapi River in North & Cardamom Hills in South.
- General Orientation is the height increases while moving South.
- Avg height = (600-700mtr)
- Narrow in North & South But wide in the middle.
- Numerous short west flowing river originate from these hill ranges



Remarks

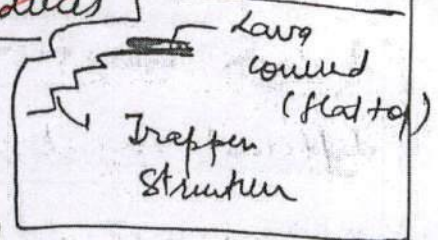
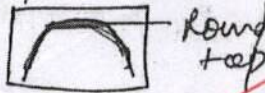
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new hill range broken only in middle near Goa where its height reduces

North Ghats - Maharashtra

Middle Ghats - Goa

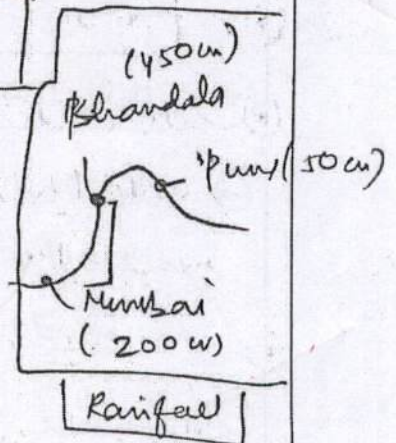
Southern Ghats - extremely rugged



① Broken by numerous gaps & passes connecting important cities.

② Significant in Regional Development

1. Orographic Barrier \Rightarrow Intense Rainfall along the Ghats create tropical evergreen forest



2. Economy dependent on trade along rivers (Goa - Mahadayi River)

3. Numerous water guzzling cropping patterns occur along western margins of western Ghats.

Laterite soil present used for brick making

4. Numerous Biodiversity hotspot zones occur in western Ghats (Bori Ghats, Nilgiri, Silent Valley) etc

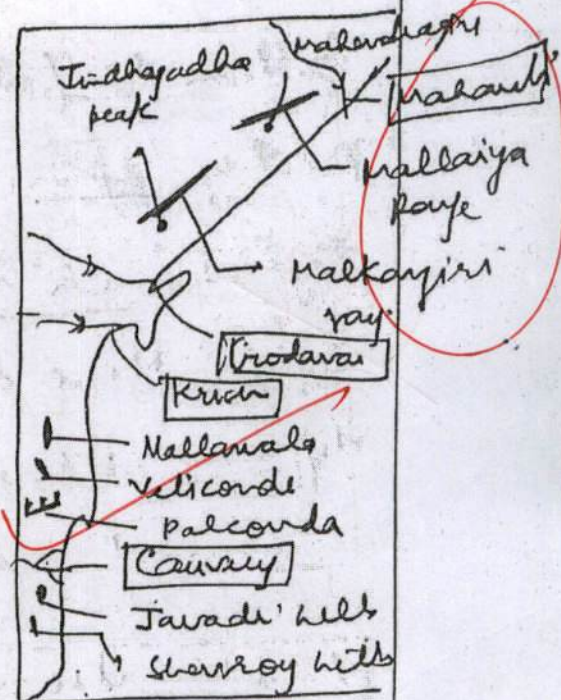
5. Faunal & floral wealth is tremendous = (6% area with 30% biodiversity)

Kasturibai Committee on W-Ghats

Remarks

Kaslem Abats

- ① Discontinuous range dissected by numerous fast flowing rivers
- ② True Mt. character only between Godavari & Mahanadi.
- ③ Heavily indented by the Deccan's
- ④ Traded due to semile stage of rivers



Significance

1. Cultivation of Paddy along the Deccan Traps
2. Minerally rich zone ⇒ Coal, iron ore
(Neyveli (Chattisgarh), Odisha)
3. Economy derived from tropical deciduous (Mow & Ulet) vegetation
4. Rich endowment of Sundari trees also benefit economy.

Thus, the two flanks of Indian Block of Plateau provide immense significance for agriculture, industry & trade & commerce.

Remarks

Good

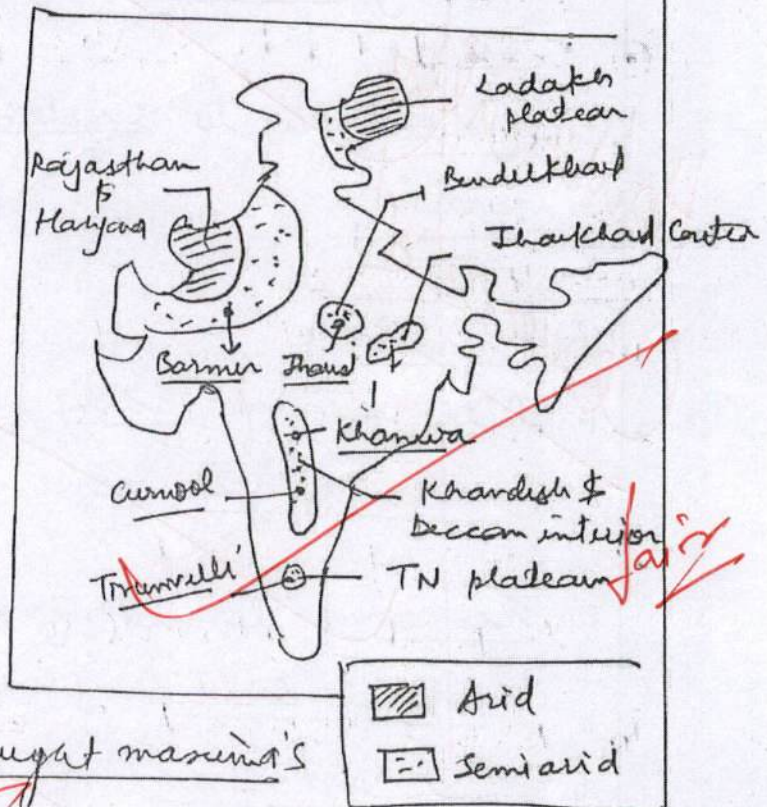
4.

3a. (b) Discuss the unique features and challenges associated with the arid and semi-arid climatic regions of India.
(200 Words) (15)

Indian rainfall regime is highly variable creating regions of both immense rainfall & regions with meager downpour. Viewing in this light, there exists immense challenges & natural differences between arid & semi arid climatic regions of India.

Arid Climatic Regions

1. Regions where rainfall $< 30 \text{ cm}$ (IMD)
2. Rainshadow region of Aravalli, Ladakh plateau
3. Saline, Arid soils present
4. Desert prone with drought maxima's
5. Mostly Barren & treeless.
6. Cropping pattern :- Cactus (Natural Vegetation)
khejri, Semul tree whereas Maize, Millet (Jowar, Bajra) is grown



Remarks

Semi-arid Climatic Regions

1. Situated on the margins of Arid Region where Rainfall = (50-30 cm)
2. Areas include margins of Rajasthan (Aravalli), North Gujarat & Southern Haryana, an area in Ladakh UT, Bundelkhand, Central Thailand, Cumool & Kaydseena & Khandesh plateau
3. Red Soil & Arid Soils is prominent
4. Ravines are created by vertical deepening by River.
(i) Chambal Ravine
(ii) Pathankot Ravine
5. Patches of Red Soil are rich cultivation of Wheat & Cotton in TN. Other crops include (Red Soil due to fix cotton)
Ragi along Gujarat plains.
6. Economically poor region:

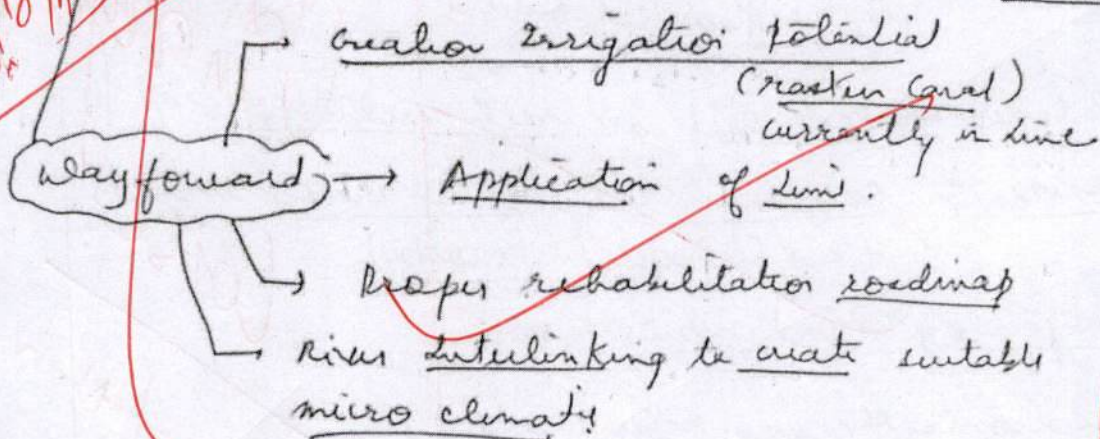
Challenges associated with Such Regions

1. Dust prone - Metereological drought has

Remarks

recurrent phenomenon.

2. frequent outbreak of diseases such as cholera & diarrhoea due to water availability
3. Faunal diversity is bare minimum → Livestock suffer from diseases like Lumpy Skin Disease & African fly
4. Water availability is low due to less rainfall (Groundwater depletion occurred)
5. & shifting Sand Dunes → agroeological danger
(a) Barmer dist.
6. Relief plains in such region must act as Case study for future (Sirchi dist)



Thus, These region possess serious challenges of survival but adequate intervention can improve the land use & potential for sustainable living.

Remarks

6

3. (c) Analyse the distribution and potential of marine resources in India, including fisheries, coastal ecosystems, and offshore oil and gas reserves. (250 Words) (20)

India is richly endowed with 7516.6 km length of coastline with which comes immense resource potential to convert India's energy demands deficit into surplus.

Marine Resources : (BIOTIC)

1. Sea weed Cultivation
along TN coast and WB coast (Hooghly) (60% import to China & ASEAN)

2. Fish Resources

Gujarat & Andhra Pradesh top the demand fulfilment - (75% export value of all marine exports)

3. Lobsters & Prawns

2nd rank for India - along Goa & Karnataka coast

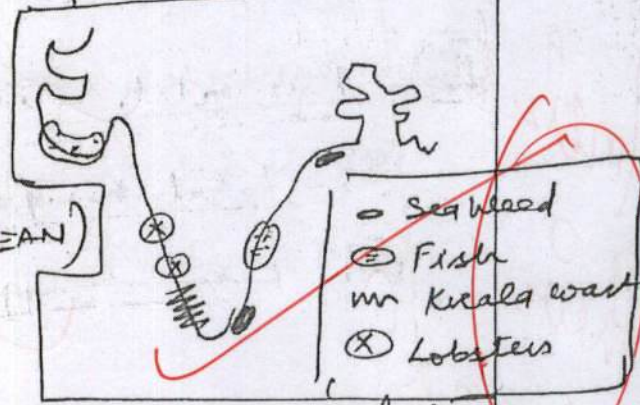
majority fishing occurs along Kerala coast

diverse resources found

(eg) Fisheries, Crabs, Prawn, algae, Seaweed, etc

Remarks

Marine production

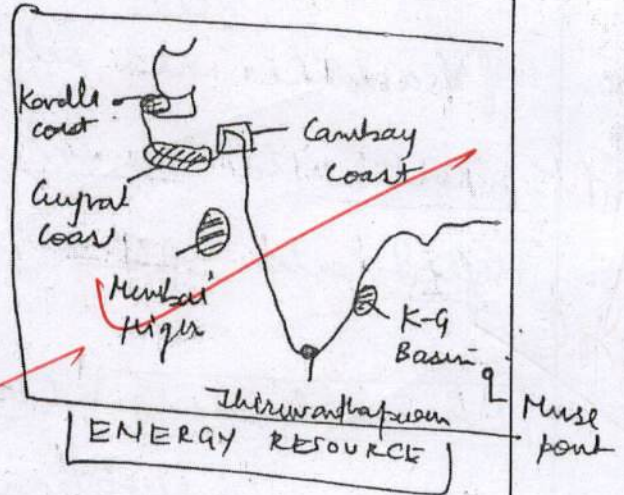


Energy Resources along Coast

I. Non-Renewable sources

* Oil & Gas Resources

- 80% oil & gas (offshore) is derived from Mumbai high
- Rest 15% from Kandla source region



II. Renewable resources

- Tidal energy plant - @ Cambay Coast
- Wave energy plant - @ Mase point (Goa)
- Thiruvananthapuram (Kerala)

Coastal ecosystem Resources

- Wetlands - mostly present along Maharashtra coast.
 - act as sink of excess water
 - also along Andhra Pradesh coast
- Tidal Creeks and Marshes - along Sunderbans

Remarks

Gujarat coast & Kerala coast

3. Mangrooves - along W.B, Gujarat (00%)
- protects us from tidal waves of high intensity
 - acts a shore breaker
 - Creates ecosystem rich in biodiversity
- (27) Rhizophora
(10) Avicennia
(8) Sonneratia (Lendubau)

4. Estuaries : Most rich ecotone found in India. high functional capacity

(29) Kerala's estuary along backwaters

India's Potential :

1. Ocean Thermal Energy Conversion plant (OTEC)
Recently installed as desalination plant in Lakshadweep. high potential for energy generation

2. Wave Energy - using Piezoelectric cubes to convert Kinetic energy \Rightarrow Electrical energy

Remarks

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2. Dredge up - Virzhingham plant (Kerala)

3. Tidal energy: Cambray constitutes 2000 MW potential for energy generation. Only 100 MW is tapped

4. Wind energy - Continuous supply of wind in form of NE Monsoon & SW Monsoon create huge potential for frictionless surface, fast wind tapping into energy

5. Biotic energy generation - using marine algae & coral generation (using Biorock technique) to generate fish resources in huge quantity

Seemingly, there exists huge resource potential in Indian coast. As Zimmerman said - "Resources are not, they become". There is no dearth of resources, there is dearth of Resourcefulness. Thus adequate investment in R&D should achieve the "Panchpran" of PM, as derive potential of "BLUE ECONOMY".

Remarks

8.5

4. (a) Discuss the challenges and opportunities associated with the management and conservation of soil resources in India. (150 Words) (10)

GSRO's space assessment centre (SAC)'s report recently highlighted the increasing rate of soil degradation where 29% of total soil is deteriorating in standards.

Include a para on resources also?

Good Start

Challenges with management & conservation:

1. Increasing rate of "base erosion", excessive translocation (due to irrigation)
2. Agriculture making soil deplete of nutrients
(29) Monoculture practices (Raddy wheat cycle)
3. Soil mining in northern India \Rightarrow used by Mafias in alteration to sand
4. Varied composition of soil in India over space
- tough for one size fit all approach
5. Livestock debasing the soil. (excessive deterioration of top soil)
6. Increased acidity (H^+ ions) - fertilizer used

Remarks

Soil forms an important component of India's agricultural ecosystem. Its protection and management brings various opportunities

Opportunities :

- Agricultural sustainability
- Increased productivity & yield
- Raising farmers income - Shardakumar committee (Double by 2022)
- Role of FDI's will be boosted
- India's FOREX would get push. 40% of FOREX comprises of agriculture & allied products
- Livestock yield would increase (better fodder)

- Best practices → Mixed & Intercropping (Bundelkhand Region)
- converting wasteland to agricultural area (Bhopal's Bhanpur Khanti)
- using ZBNF (Subhash Pantasi technique)

Soil conservation is an important component of SDG-15 - life on land. Thus its conservation is imp.

Remarks

Good Attempt

4.5

4. (b) Explain the concept of watersheds and their role in the management of water resources. (150 Words) (10)

Watershed is total collection area of a running stream that it catches from various sources.

(eg)
 { Precipitation
Sub-streams
Groundwater



Concept of Watershed

1. Quantifiable increase in groundwater due to percolation
2. Satisfies the need of the locality
3. Increased runoff to the mainstream increases availability of freshwater
4. Increased role in micro-climatic variation
5. Green zone constituting significant biotic component

Role in managing water resources

Remarks

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1. Helps in availability of water during lean season (eg) Luni watershed feeds Siroli district (Rohi Plains)

2. Prevents excess runoff - shock absorber
Haryana's watershed acted as a sink
during floods (Yamuna)

3. Increased groundwater availability.

4. Demand of irrigation from electric resources reduced due to canal irrigation

5. Helps significantly in altering the micro-climate
Healthy watershed → Regular precipitation

Threats

(i) Aarey watershed → increased frequency of heatwaves & fall in groundwater availability due to metro parking realisation

Thus preserving & protecting watershed through Integrated watershed management techniques augmented by Rainwater harvesting is the need of the hour

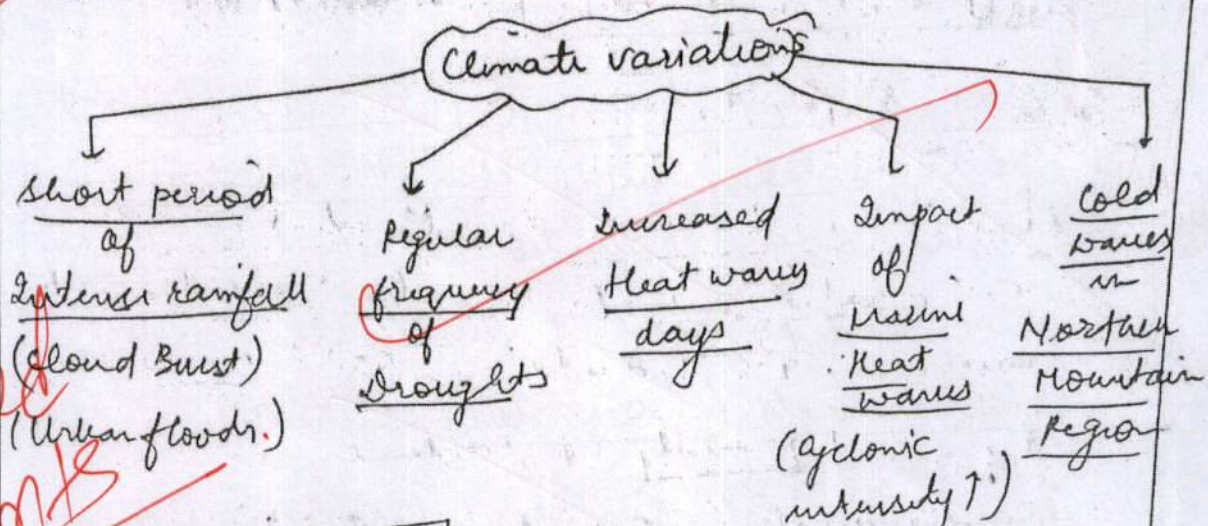
Remarks

3.5

Fair

4. (c) Discuss the socio-economic implications of climatic variations across different regions of India. (150 Words) (10)

Recent IPBES data has highlighted that changing climate along tropics will significantly impact the social & economic aspects across the tropical nations. India is under threat too.



Social Implications :

1. Women - Double Burden - found for energy security (fuelwood)
2. Increased vulnerability of marginalised sections (e.g) manual labourers & scavengers workload would increase (landfills & floods)
3. Threat to health of common people.

Remarks

→ Extreme heat waves

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Rise in diseases (Cholera, Diarrhoea)Mosquito Borne diseases (Dengue, Malaria)4. Impact on educational outcomes - school closures5. Health & Nutrition deficiency.(Eg) Wasting, Stunting & Anaemic (Sroughts)6. Loss of Biodiversity and threat to sustainable rural livelihood (agri productivity ↓)Economic Implications:1. Loss in work hours (eg Mumbai floods)
every holiday due to climate related events
cause 0.9% reduction in GDP (Mackinsey)2. Increased poverty & burden on working
individuals (Dependency Ratio ↑)3. Management of Biodiversity Resources deteriorate4. Ecosystem services suffer → Impact livelihoodThus adequate adherence to Nationally
Determined & Contribution to fulfil Paris
accord (2°C) should be a step in right directionto fulfil Global goals & portray India as VISHWAGURU

Remarks

8.5

Avoid
repetition
of
same
conclusion

4. (d) Analyse the factors influencing the formation and characteristics of different soil types in India. (150 Words) (10)

India constitutes a multitude of soil due to various soil forming processes (Pedogenesis) acting within the bounds of territory.

Various soil forming processes include

1. Weathering & Erosion

(eg) Black soil of Deccan plateau & Kathiawar Peninsula

2. Organic material

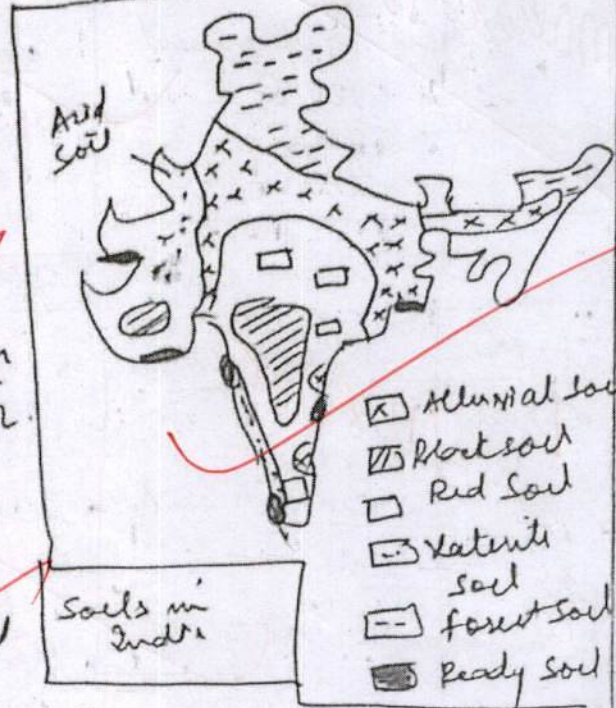
(eg) Peaty soil in coastal areas (Sunderban Wetland)

3. Translocation

(eg) High Rainfall & High Temperature
(Laterite soil) (Red soil) (Arid soil of Rajasthan)

4. Gleying (eg) Marshy soil of Sunderbans & wetland region

5. Oxidisation (eg) Red & Yellow soil



Remarks

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Characteristics of soil in India:

1. Alluvial soil

- Immensely fertile
- Rich in potash but poor in phosphorus
- 3 types predominant
 - Riverine
 - Coastal
 - Alluvial

2. Black soil

- Inverted soil with self ploughing capability
- Rich in lime & Nitrogen
- Swells when hydrated, cracks when dry

3. Laterite soil

formed due to heavy rainfall & high temperature
essential bases leach out

Iron and aluminum are left behind

- Fertility = very low
- Used for bricks

4. Red & Yellow soil

- at margins of Deccan plateau
- high temperature and low rainfall
- iron \Rightarrow diffusion \therefore Red
- if hydrated \Rightarrow Yellow
- average fertility

Cotton ground

5. Forest soils

- due to high humidity and damp conditions
- Rich in organic matter

6. Peaty soil

found in marshes & wetlands
Low fertility

7. Arid Soil

- Dry & calcareous
- fertilizer of water is added

India's soil composition makes it one of the most agriculturally fertile & diverse nations of the world. Soils, thus must be protected from rising desertification & De-nutrition.

Remarks

2

4. (e) Evaluate the influence of altitude and topography on the formation of the alpine and sub-alpine climatic regions in India. (150 Words) (10)

India possess significant relief features and varied climatic classification. On further studying it was found that these two are intimately interconnected.

Influence of altitude on formation of alpine and sub-alpine topography climate:

1. As height increases
 - the impact of sunlight increases (more intense)
 - Temperature reduces (Normal lapse rate $6.5^{\circ}\text{C}/1\text{km}$)
 - Precipitation varies
2. Faunal diversity significantly alters.
3. Floral diversity depending on physiographic features too varies.

Its impact is witnessed on comparison of West & East Himalayas:

West Himalayas: gradation is not as vivid as East side
East Himalayas: high tree line very low; vegetation too varies

Remarks

* Include briefly Griffiths classification.
 ET & EF

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East Himalayas - as height increases, subsequent vegetation occurs making climatic differences vivid

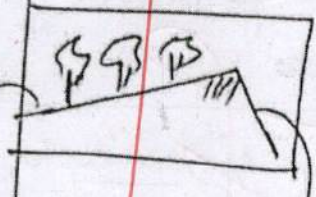
⇒

0-900m	900-1800m	1800-2700m	2700m-3600
Tropical climate	Temperate climate	Taiga climate	Tundra & Barren climate

Impact of topography on alpine & climatic regions

1. Rugged topography → Southern Himalayas are mostly barren & low in vegetation in comparison to Northern slopes of Himalayas inspite of adequate precipitation & sunlight

N. slopes



S. slopes

2. Impact of orographic rainfall: As height increases inversion of rainfall occurs even on the windward side causing differences in conditions



- ∴ Crops prevalent: Mosses, Lichen, Rhododendrons, algae & Bryophytic plants

Thus altitude & topography significantly impacts the climatic variation. Best example ⇒ Agra & Shimla - on same latitude, yet different climate

Remarks

4

Apt

5. (a) Discuss the distribution and availability of surface and groundwater resources in different regions of India. (200 Words) (15)

Recent Central Groundwater Board's (CGWB) report has highlighted a total of ~~438~~ 438 Billion cubic metre (BCM) of groundwater potential and 698 BCM of surface water potential in India.

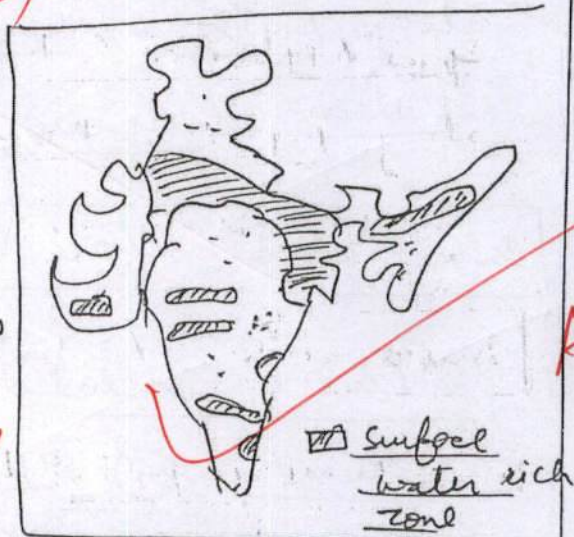
*Delemb
Start*

Distribution of surface water :

- ① Majority surface water is present in North India

• Ganga & Brahmaputra Basin (49%)

- ② South India constitutes patches of surface water along major rivers. (30%)



① CGWB Report

- ③ Remaining surface water (21%) is equally spread along various locations remaining unshaded portion of fig ①

APAT

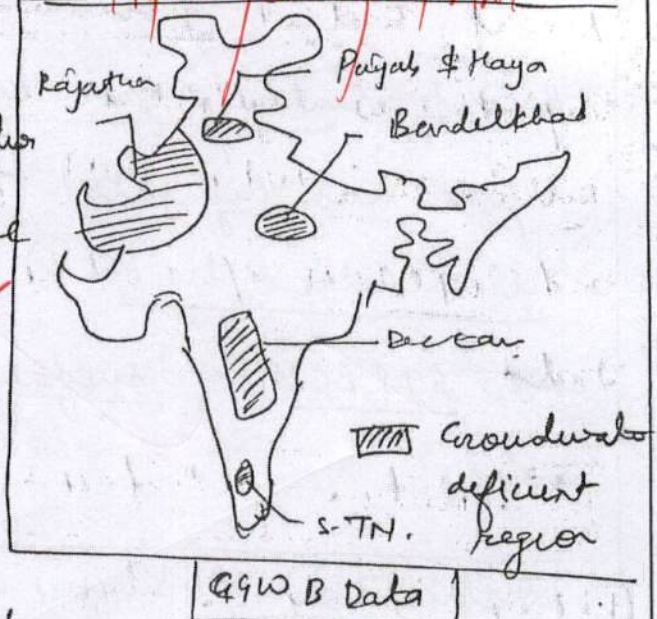
Remarks

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Distribution of Groundwater :

1. Satellite pictures & mapping suggest groundwater concentration in regions along surface water excess.

Hydrogeological Map.



2. Large patches of Red zone have been mapped by ISRO's

Space Application Centre

along Rajasthan, Haryana, Punjab and Deccan Plateau as region with deficient GW.

Issues with Surface water

1. Intensely polluted due to industrial effluents. (e.g.) Minamata Disease, Itai Itai disease
2. Discharge of ~~garbage~~ & sewage into rivers without treatment.
3. Eutrophication due to fertiliser's use → Algal Bloom

Remarks

4. Thermal changes in rivers due to climate change reducing its usage
5. Increased waste → unable to collect excess waters (from runoff).

Issues with groundwater:

1. Excessive extraction due to intensive monoculture practices. (19) Rice & Wheat in Punjab
2. Subsidy misused by farmers (19) West UP electricity stealing
3. Irrigation practices
4. Geogenic & Anthropogenic mixing of chemicals
(9) Arsenic, Fluoride, Uranium, phosphate, etc.
(Punjab & Haryana) (Bihar)

* You need Add core studies on both.

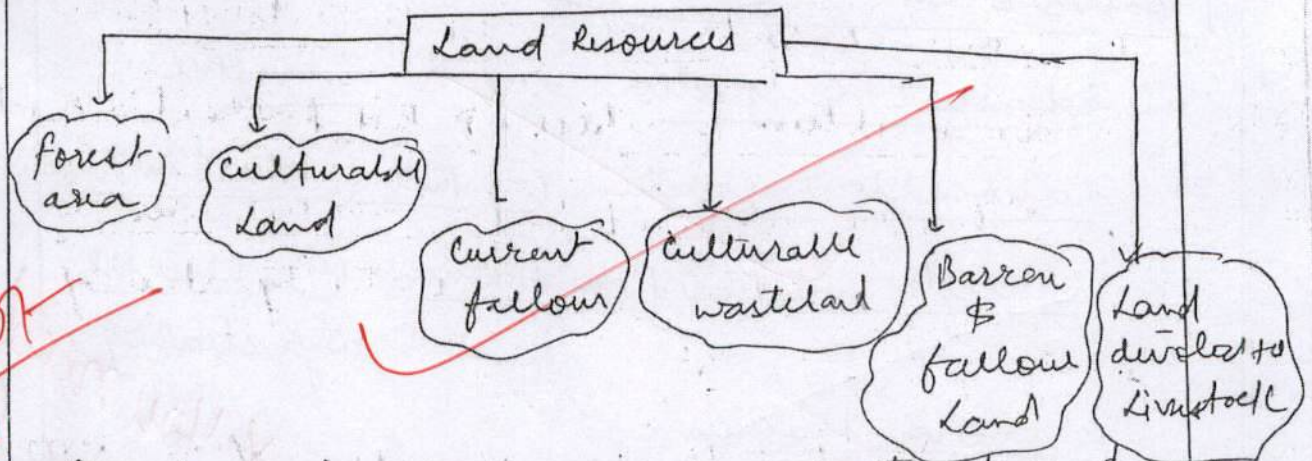
Thus, adequate measures in order to prevent such misuse is the need of the hour. Rainwater harvesting along with Integrated Watershed Management is the need of the hour to ensure "Har Khet Ko Pani" and availability of drinking water.

Remarks

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5. (b) Compare and contrast the characteristics and significance of agricultural land, forest land, and urban land in India's land resource management. (200 Words) (15)

India is richly endowed with 3.2 lakh sq km of land area being the 7th largest nation in the world. Large land area gives India plenty of Land Resources.



Due to increasing economic opportunities & requirement, land use patterns of India are changing too.

① <u>Agricultural Land</u>	
<u>Characteristics</u>	<u>Significance</u>
+) <u>Rural dominated</u> +) <u>Heavily intensive cultivation</u> +) <u>Subsistence prominent</u>	+) Contribute <u>19% to GDP</u> +) <u>Dependent population</u> = <u>53%</u> +) Forms the <u>backbone</u> of <u>Indian manufacturing sector</u>

Remarks

Good

- Requirement & putting fertilisers (DAP, Urea)
- Fragmented land area (Due to policies & Indian culture)

→ Societal dependence for various purposes

Hedge against climate & other vulnerabilities

Used for eating livestock (13% of GVA)

Urban Land

Characteristics

1. Dominated by Urban Land use - Service & Manufacturing
2. High Land prices (Inflated)
3. Multiple use of same land - Residential & Economic
4. Heavy dependence due to high densities
5. Fragmented sub-holdings

Significance

1. Contribute 80% of total GDP.
2. Rising urbanisation causing rural agricultural land pressure
3. Role in economic growth
4. Rising social crimes against women & children

Forest Land

Characteristics

- ① 24.4% of total land area classified as forest (IFSR-2021) report

Significance

1. Provide basic raw material to both agriculture & manufacturing

Remarks

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2. Devoted to protected areas

4. NP's & WL's

3. Increased prevalence of deforestation to settle rising population

2. Imp. component of PUTQ's & ST's lifestyle

"Jal, Jung & Jameen"

3. Rising prevalence of shifting agriculture

4. Increased rights awareness

Threat to Indian Land Resources

1. Forest

* Deforestation

* Underutilisation due to tribal clashes.

* Diverted for accommodation

4. Sarey forest area

2. Agricultural

* Decreased fertility

* Nutrient depletion

* Prevalence of fallow increasing

* Changing land use

Rururban fringe \Rightarrow Urban areas

3. Urban

* Rising concretisation

* Changing urban landscape

(Greening - decreased)

* Pollution due to vehicular emission

* Role of construction & mining for metals

Thus good practices such as hydroponics, aeroponics (urban areas), Restoration of fertility for rural land & land left virgin for forest land

should be practiced. (National Forest Policy - 1988)

Remarks

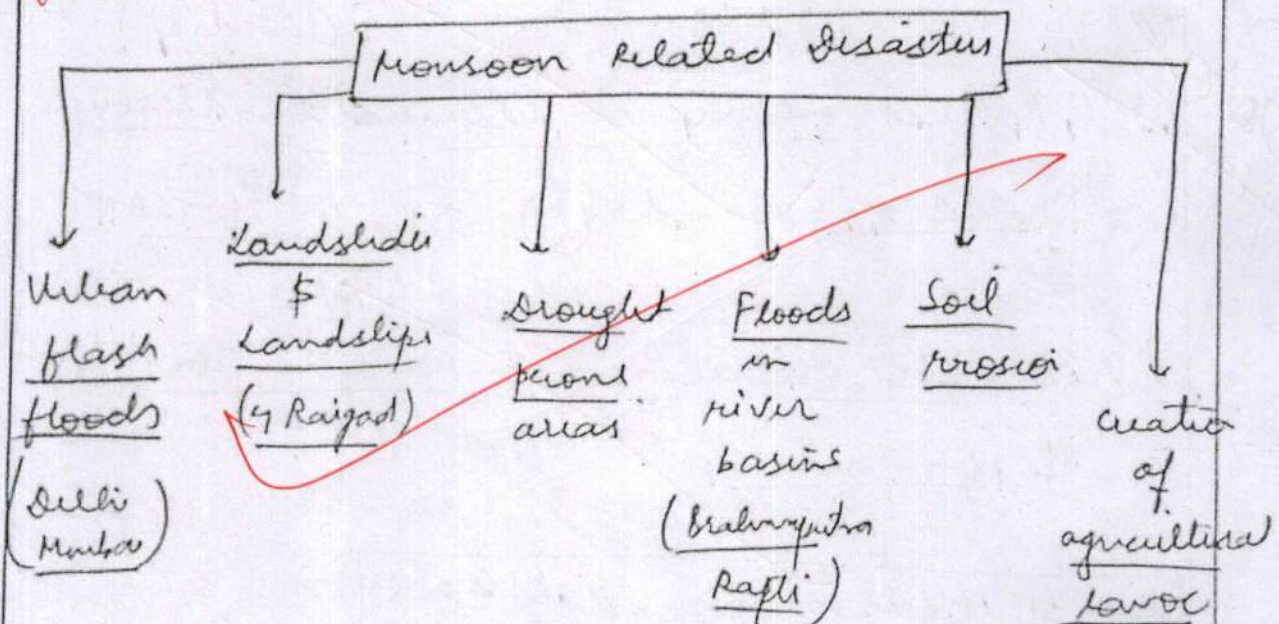
8

Exceptional Good Answer

5. (c) Discuss the role of monsoon forecasting and early warning systems in mitigating the socio-economic impacts of monsoon-related disasters. (250 Words) (20)

Mitigation is a technique of reducing of the impact of the climatic vagaries on humans and their surroundings.

Increased intensity of changing weather patterns have necessitated the creation of robust monsoon forecasting and early warning systems (EWS).



These monsoon related disasters along with increased concentration of un-seasonal cyclonic storms

Remarks

APOT

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have amplified the need of robust forecasting

Robust Monsoon forecasting & EWS

1. Adequate measurement & delineation of long period average (89 cm (1961-2021))
2. Spread of Satellites (IRNSS) for weather related data.
3. Cross-connectivity with global measurement forums
(eg) { Copernicus + NASA + EU-Space + ISRO } (Woodsat)
4. Robust information dissemination through mass info spread. (eg) Bihar's "MAUSAM" app.
5. Disaster preparedness & Rehabilitation before & after occurrence

Role of Monsoon forecast & EWS

1. Ensure agricultural cropping seasons are aligned with climate phenomenon

Remarks

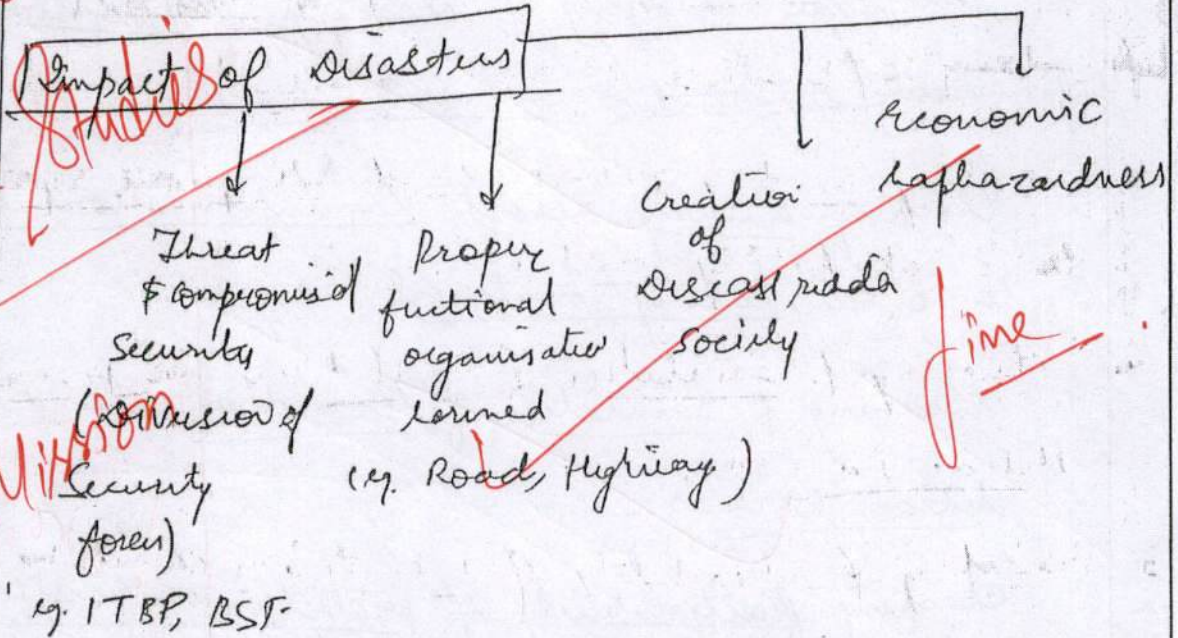
APOT

- (29) Early & Late sowing information for Paddy during monsoon
2. Adequate dredging & cleaning of River beds before ~~during~~ information occurrence of disaster
3. Checking landings across landslide prone region to check falling material
4. cleaning & sanitation of local drains to prevent Unkown hazards.
5. checking functionality of protection mechanisms
- (29) Setrapods of Mumbai & Odisha
6. During & After disaster rehabilitation programs in place
7. Coordination between multiple agencies
- (29) NDMA + DDMA + Local police & para
(constab) military
8. Resource requirement is fulfilled
9. Health & education along with Rescue centres are better equipped.

Remarks

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10. Proper cleaning & de-dredging of wetlands
 acting as a sink



Solution for boosting EWS & Monsoon forecast

1. Creation of feedback mechanism. (Microclimate) changes.
2. Proper spatial & geospatial alignment of Satellites & interoperability.
3. Robust information dissemination.
4. Empowering 3rd tier (eg) TN's district climate officers.

Thus, disasters significantly impact economy, society & livelihood along with lives. Its mitigation, fighting increased frequency (1.1°C) is must for survival.

Remarks

9