TEST CODE	8	3	3	2	1	9

ATS 2025

Time Allowed : Three Hours
समय : तीन घंटे

ForumIAS

Maximum Marks : 250
अधिकतम अंक : 250

Geography/ भूगोल

Name Of Candidate परीक्षार्थी का नाम	Rohin Kumar		
Roll No./ अनुक्रमांक	1910139147	**Medium/ माध्यम**	English ☑ हिंदी ☐
Center Code/ परीक्षा केंद्र	1901	**Date/ दिनांक**	10/08/2025

*Center Code : For Online – 1900 / Delhi : Karol bagh – 1901, ORN - 1902, Mukharji Nagar - 1903 / Patna : Boring Rd. – 2001 / Hyderabad : Jawahar Nagar - 2101

INDEX TABLE / अनुक्रमणिका

Q. No. प्र.सं.	Max. Marks अधिकतम अंक	Marks Obtained प्राप्तांक
1		
2		
3		
4		
5		
6		
7		
8		
Total/ कूल अंक	**250**	

Examiner's Discretion/ मूल्यांकन कर्त्ता का विवेक:

Total Marks/ कूल अंक :

*Examiner's Discretion is the marks awarded at the discretion of the examiner based on your overall impression, on the basis of (but not limited to) your handwriting, presentation, use of diagrams, flowcharts, facts and figures or absolutely anything that he/she liked in your copy.

मूल्यांकन कर्त्ता का विवेक अंक आपकी लिखावट, प्रस्तुति, आरेखों के उपयोग, फ्लोचार्ट, तथ्यों और आंकड़ों या समग्र रूप किसी अन्य विषय वस्तु, जो मूल्यांकन कर्ता को आपकी कॉपी में पसंद आयी के आधार पर (लेकिन इन्हीं तक सीमित नहीं) पर दिए गए अंक हैं।

INSTRUCTION / अनुदेश

1. Do furnish the appropriate details in the answer sheet (viz. Name, Email, Roll No, Mobile).
उत्तर पुस्तिका में उपयुक्त विवरण (जैसे नाम, ईमेल, रोल नंबर, मोबाइल) प्रस्तुत करें।

2. There are EIGHT questions divided in two Sections in the question paper. Question 1 and 5 are compulsory. You can attempt any THREE out of the remaining, Choosing at least ONE Question from each section.
प्रश्न पत्र में आठ प्रश्न दो खण्डों में विभाजित हैं। प्रश्न 1 और 5 अनिवार्य हैं। आप प्रत्येक खंड से कम से कम एक प्रश्न चुनकर, शेष में से किसी भी तीन का प्रयास कर सकते हैं।

3. The number of marks carried by a question/part is indicated against it.
किसी प्रश्न/भाग द्वारा किए गए अंकों की संख्या उसके सामने दर्शाई गई है।

4. 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.
उत्तर प्रवेश प्रमाण पत्र में अधिकृत माध्यम में लिखे जाने चाहिए, जिसका उल्लेख इस प्रश्न–सह–उत्तर (QCA) पुस्तिका के मुखपृष्ठ पर दिए गए स्थान में स्पष्ट रूप से किया जाना चाहिए।

5. Word limit in questions, if specified, should be adhered to.
प्रश्नों में शब्द सीमा, यदि निर्दिष्ट हो, का पालन किया जाना चाहिए।

6. Content is more important than content length.
विषय–सामग्री लंबाई की तुलना में विषय–सामग्री अधिक महत्वपूर्ण है।

7. Any page or portion of the page left blank in the Question-Cum Answer Booklet must be clearly Struck off.
प्रश्न–सह–उत्तर पुस्तिका में खाली छोड़ा गया कोई भी पृष्ठ या पृष्ठ का भाग स्पष्ट रूप से काट दिया जाना चाहिए।

For Student Only / केवल परीक्षार्थी प्रयोग हेतु

Start Time/ प्रारंभ करने का समय :	**End Time/ समाप्त करने का समय:**
Mode Of Examination/ परीक्षा की विधि :	Online/ ऑनलाइन ☐ Offline/ ऑफलाइन ☑

For Office Use Only / केवल कार्यालय प्रयोग हेतु

ECN CODE/ ईसीएन कोड :	**EG/ ईजी :** ① ② ③ ④ ⑤	**Evaluation Date/ मूल्यांकन तिथि :**

Note: Students are expected to incorporate suggestions from the feedback provided in the answers. Discussion classes for the tests are also available online in your portal to aid in your preparation. Further, students are requested to see the good copies of the tests and learn from them. You can also discuss your copy with a Mentor and discover ways and means to improve your answers, or if you have any issues with this test / copy. Ask specific questions, to get specific answers.

EXAMINER'S REMARKS

CRITERIA FOR THE FEEDBACK SECTION AT THE END OF EACH QUESTION

1. **AWIS = Answered What is Asked.** This means whether you have addressed the core demand of the question or not. Addressing the core demand of the question gets you an objectively fair score. It is examiner's perception if you have understood the question and if you know the answer in the first place. Creative answer writing, sometimes missing the core demand, may fetch very high or very low scores, and exposes your answer to the subjectivity of the examiner.
2. **CD & VA = Content Density & Value Addition.** Examiner will evaluate the quality and quantity of your content in the answer. In the same word limit and space limit have you (a) written what is asked (b) gone beyond what is asked (c) enriched answers through combination of (but not all!) suggestions, ideas, quotes, flowcharts, diagrams, facts and figures, data etc. This affects objective components of assessment.
3. **S & F = Structure & Flow** = Whether you have structured your answer properly or not. Whether the answer has been broken into parts and sub-parts and each part has been addressed appropriately or not. Whether the flow of the answer is maintained. Affects both subjective and objective components of assessment.
4. **P & R** = How your answer performs on the criteria of **presentation, ease of read, clarity and apparent effort** in writing the answer. This affects the subjective components of assessment.

Section– A

Q.1) Answer the following questions in 150 words.

a) Differentiate between uniformitarianism and catastrophism with examples from geomorphic processes. (10 Marks)

Earth is belived to have started evolving ~4.6 Billion years ago. It underwent several geomorphic processes to gain its form.

Uniformitarianism

→ Propounded by James Hutton in his dictum "present is key to past".

→ It postulates that the factors involved today in landform development have always existed.

→ The intensity & frequency of these agents of gradation may have varied.

e.g. The same fluvial processes existing today have earlier shaped following a cyclical concept (Davis).

(ii) **Catastrophism**

→ It involves the sudden events that imprints on the earth's surface.

e.g. Earthquake, Vulcanism etc.

→ Thus the time frame for catastrophic events is small compared to uniformitarianism.

e.g. The detachment of ~~Gon~~ Indian landmass from Gondwanaland.

Thus, earth's surface today is result of both catastrophic & gradual phenomenas. Varying with climatic conditions & physiography understood by Erosion surfaces & denudation Chronology

b) Explain the role of geostrophic balance in influencing atmospheric circulation. **(10 Marks)**

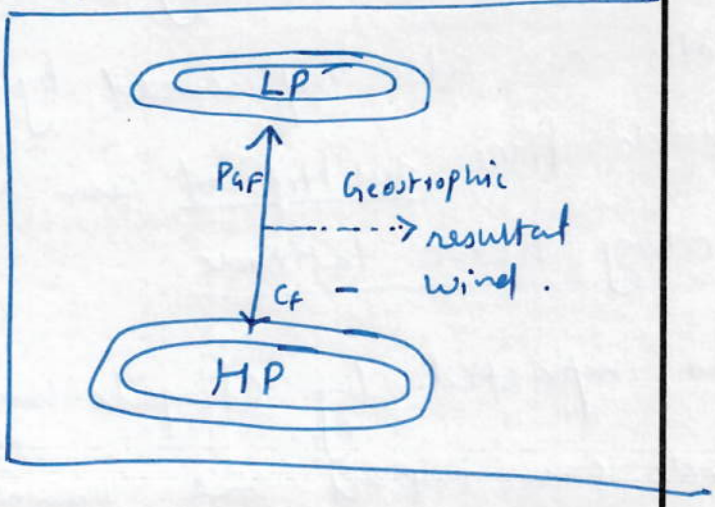
Geostrophic balance is the balancing of pressure gradient & Coriolis force in the upper atmosphere caused due to absence of friction b/w layers of airmass.

e.g: Geostrophic Winds in upper troposphere.

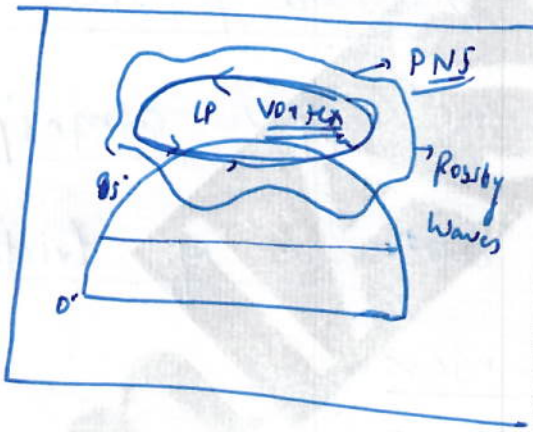
Role in influencing circulation

(i) Jet Streams in troposhere are resultant due to geostrophic balancing.

↳ These winds blow from west to east parallel to Isobars.



(ii) Polar Vortexes → these depend upon the jet streams as these are formed over polar areas.



→ Rossby waves, due to weakening of jet streams are extended towards the south parts, leading to cold winds in USA, Canada.

(iii) upper air circulation over tri meridional circulation of Hadley, ferrel & polar cells are also influenced by these geostrophic winds. like subtropical air subsidence along horse latitude.

Thus, impacted by climate change geostrophic winds can impact the fundamental circulation patterns.

Feedback

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Please put tick marks in the above table.
Here G is Good, A is Average and P is Poor.

TOTAL MARKS	

c) Discuss the concept of pedogenic regimes and their significance in soil classification. (10 Marks)

Pedogenic regimes involves the processes forming the various horizons of the soil profile. It involves nutrient, minerals & humus enrichment caused by process of Illuviation & Eluviation.

Significance in soil classification

(i) Laterization is the deposition of silica & bulk materials in upper layer typically in humid & moist conditions.
e.g. Tropical rainforest regions.

(ii) Humification → deposition of humus rich organic materials in the

top horizons of soil, that forms decayed organic layers. e.g. Chernozems ~~Pierozems~~

(iii) Podzolisation / calcification involves the accumulation of calcium due to 'capillary action'.

e.g. Desert soils or Serozems

Apart from the formation of soil regimes, anthropogenic interference have led to soil degradation as alkalinisation, salinisation which needs to be reversed by Land degradation neutrality by 2030.

Feedback

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Please put tick marks in the above table.
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TOTAL MARKS	

d) Explain the idea of distance decay in human geography, with suitable illustrations. (10 Marks)

① Distance decay involves the weaking of a phenomena / activity upon moving away from a point. It is indirectly proportional to distance.

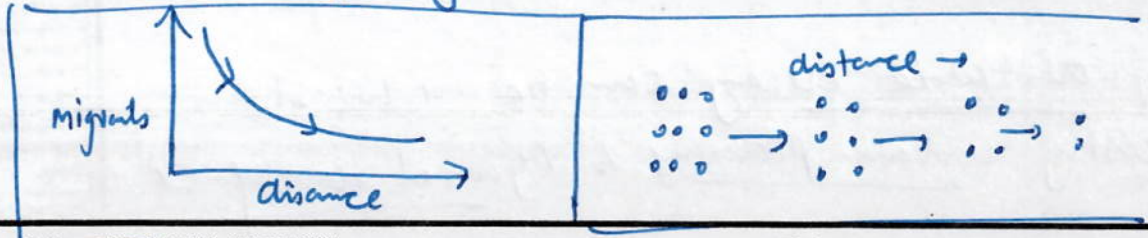
e.g. Migration upto long distances.

Illustrations from human geog.

(i) Migration :

↳ (a) Ravestein discusses that no. of migrants decreases as distance increases.

(b) Inverse distance law of GK Zipf that no. of migrants decrease with distance.



(c) Stouffer's Law of Intervening opportunities States magnitude of migration is inversely proportional to intervening opportunities.

(ii) Settlements:

(a) CBD / urban morphology models → Standard of living increases away from the centre.

(b) Gravity model of Zipf & Raitley's Retail model of gravitation → functional capacity decreases away from the city centre & depends on size of city, validated by peter converse.

(iii) Locational analysis: Weber & Von Thunen both have discussed the concept with increasing cost or decrease in land value.

Thus, distance decay can be utilised in assessing urban planning & regional development.

Feedback

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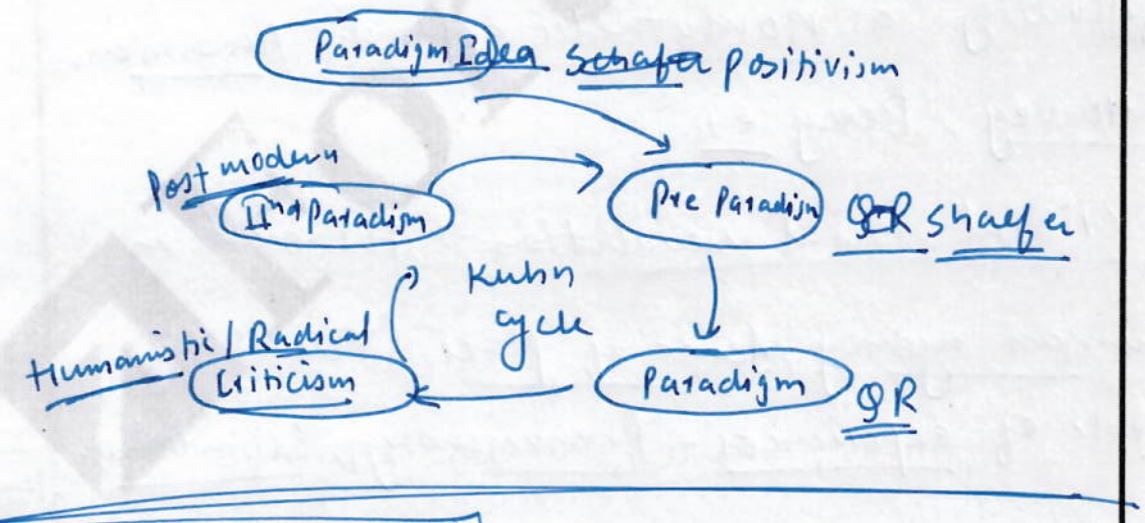
TOTAL MARKS	

e) Examine the role of paradigm shifts in the development of geographical thought. **(10 Marks)**

Thomas Kuhn propounded the concept of paradigms. It discusses the gradual change in the content & nature of a discipline over a period of time passing through stages.

e.g. Quantitative revolution followed by critical social revolution.



Paradigm shifts:

(i) Man Environment relation → as the dominant most theme with

ideas of determinism (Semple), Possibilism (Blache).

(ii) Regional paradigm → to study the uniqueness of regions with man not seperate from nature. e.g. Richard Hartshorne's Areal differentiation.

(iii) Quantitative revolution → with ideas of positivism. to focus on deductive empiricism, following a nomothetic approach. Ackerman, Harvey, Berry etc.

(iv) Critical social revolution → focused on human agency, sense of place (Tuan), role of experiences - Phenomenology, Existentialism.

(v) Going through numerous stages geography today have evolved into a multidisciplinary science with critical relevance for humans.

Feedback

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Please put tick marks in the above table.
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TOTAL MARKS	

Q.2) a) Discuss the Davisian cycle of erosion and critically examine its applicability in arid regions. (20 marks)

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Feedback

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Here G is Good, A is Average and P is Poor.

TOTAL MARKS	

b) "Atmospheric stability plays a key role in weather formation." Elaborate with reference to lapse rates. (15 marks)

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Feedback

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Here C is Good, A is Average and P is Poor.

TOTAL MARKS	

c) Examine the relationship between plate tectonics and the distribution of volcanoes across the globe. (15 marks)

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Feedback

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TOTAL MARKS	

Q.3) a) Analyse the causes and consequences of ENSO events, and their teleconnections with the Indian monsoon. (20 marks)

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Feedback

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TOTAL MARKS	

b) Explain the significance of laterization and podzolisation in soil fertility management. **(15 marks)**

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TOTAL MARKS	

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c) Discuss the principles and limitations of Central Place Theory. (15 marks)

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Feedback

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TOTAL MARKS	

Q.4) a) "The quantitative revolution in geography was a methodological turn rather than a philosophical one." Comment. (20 marks)

Quantitative revolution is an attempt to systematise geography, revive its scientific approach, generalisation. It was underlined by ideas of Komte's positivism to move away from geography's quinquiry for uniqueness.

Methodological turn

(i) It focused on newer methods of statistics → correlation regression.
↳ predictive frameworks.
↳ hypothesis testing.
↳ locational analysis. (gravity models).

(ii) It replaced the methods of sampling to remote sensing for data collection.

(iii) The methods of data analysis were sophisticated to GIS with the golden calf computers back then.

Philosophical turn : yes

(i) It focused on deductive empirical approach with reality as something that is observed.

(ii) It rejected the Idiographic approach as seen in the Schafer-Hartshorne debate, where normative questions were sidelined.

(iii) It adopted quantification and generalisation with homogenisation of reality as the core theme of geography. seen in Models in Geography Peter Haggett. RJ Chorley, David Harvey.

However, QR was criticised by subsequent methods and paradigms for:

(i) Dehumanizing geography by ignoring the normative questions, human experiences & perceptions can not be ignored in deciphering reality.

(ii) Marxist & radical geographers called for changes as geography under QR could not answer qs of deprivation poverty.

(ii) Limitations of models in depicting the reality. due to lack of applicability worldwide. e.g. Economic rationality & Isotrophic plain (weber) were challenged.

(iii) The post modern geographers raised pertinent Qs of gender equity, Sustainable development which could be answered by geographic models.

Thus, QR was a significant watershed in the evolution of geographic in terms of methods, philosophy. However it is with human relevance could the discipline be justified properly.

b) Explain the processes of mass wasting, and examine their role in shaping landscapes.

(15 Marks)

Mass Wasting is the phenomena of movement of large masses of eroded material under the influence of gravity. Eg. Rock fall, mud flow.

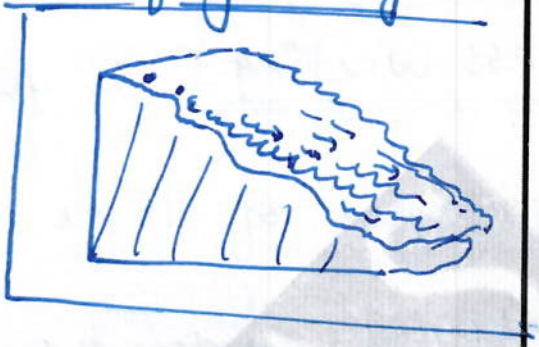
Required conditions/ determinants

- Gravity → sustains the flow.
- Slope gradient → determine extent.
- agents → like water, snow that facilitate.
- vegetation availability → slope stability.
- geological structure → loosly alluvium, consolidated.

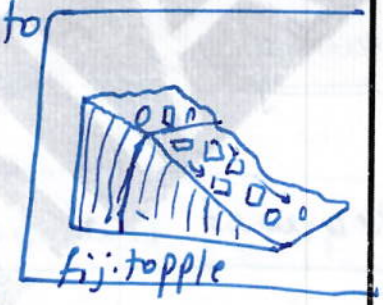
Processes of mass wastiy

(i) Rock flow → It involves the large scale flow of eroded rock

material under influence of gravity and facilitaton.



(ii) Rock topple → It is rolling down of rock boulder under gravity leading to



(iii) Mud flow → involves the soliflucti'on with the granules transported down stream due to mixing with water.

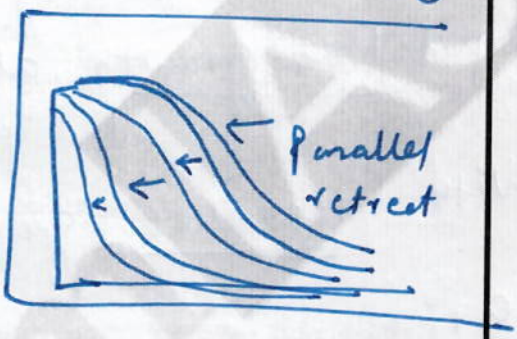
(iv) Rock slide : involves the ~~gradual~~ sudden movement of blocks of rocks along the slope that destablises the slope.

Role in landscape Shaping

(i) Degradation of summits or watersh divides of big mountains thus reducing

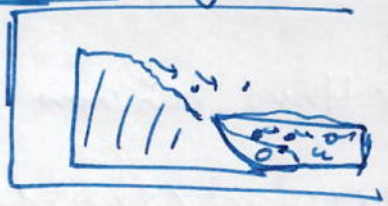
the height (Davisian concept).

(ii) Slope retreat by King → leads to gradual movement of slope horizontally to reduce the slope from convex face to concave face.



(iii) Valley widening: Landforms in the mature & old stage experience horizontal U shaped valley formed.

(iv) Alluvial fans & deposition along the montains terai region.



Thus landscape undergo transformation by erosion & deposition & evolution of Slope of the landscape.

Feedback

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Please put tick marks in the above table.
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TOTAL MARKS	

c) Discuss the relationship between population-resource regions and Malthusian theory.

(15 marks)

Malthus in 1798 propounded this concept of population - resource dynamics as population growth at geometric rate with resource growth at the arithmetic rate.

Concept:

Positive checks : Epidemics, wars, conflicts.

Preventive checks : Moral restraint, delay marriage.

Population resource regions & Malthus

→ Malthus discuss the significance of Carrying capacity of a region determined by the geodemographic load of the region.

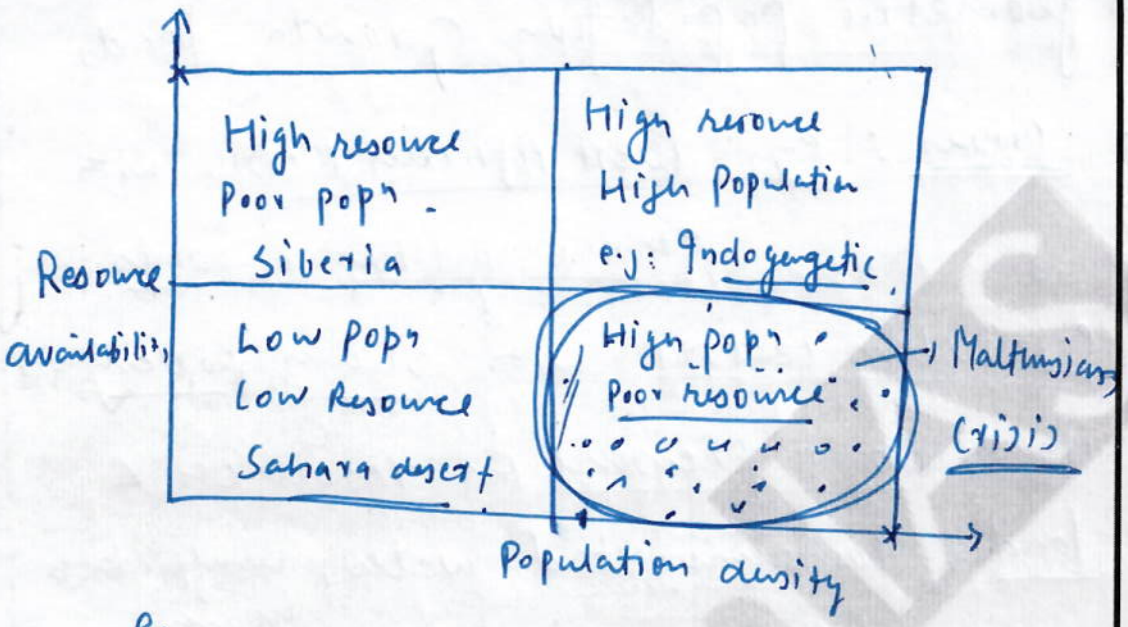

fig: Malthusian logic

(i) Low population low resource regions are more or less self sustaining with indigenous communities relying on scarce resource.

(ii) High population & high density regions again experience optimal availability.

(iii) High resource poor population → these do not face (risis) due to lesser pressure on the resources e.g. Central Asian Region

(iv) Low Resources & high density → the arithmetic growth of resources

& geometric population growth leads to crisis : e.g. West African crisis with ethnic conflicts & coups.

↳ e.g. urban centres with slums, poverty with excessive pressure on resources & land → contaminated water, unaffordable houses. Pollution.

Checking malthusian checks

~~Neo~~ ~~Positi~~ → Resource expansion with innovation (Simpsons) in his S curve of Population growth

↳ Agricultural revolution (HYVs)
↳ ICT revolution
↳ Medical revolution.

following the path suggested by Brutland commision we can tread on sustainable development to avoid crisis suggested by club of Rome.

Section- B

Q.5) Write short notes on the following in 150 words.

a) Differentiate between formal, functional, and vernacular regions with examples. **(10 Marks)**

Whittelsey committee & German school have defined region as a unit of spatial organisation characterised by unique assemblage of diverse phenomenas. It is an "intellectual concept."

(i) **Formal regions:**

↳ these are regions of homogenity

↳ characterized by unique characteristics discrete to the region.

↳ It is defined and quantified for purpose of study.

e.g. Natural regions, cultural regions with a discrete characteristics like Rainfall, Layuge.

(ii) **functional region** as suggested by "Philbrick" as spatial unit bounded by its functional character along a node.

e.g. Central place theory's market region Port & its hinterland.

↳ its extent is fluid as depend on the function of a particular unit like Loschi's demand cone for different services.

(iii) Vernacular region:

↳ A unit of imagination by people.

↳ It's extent depends on imagination as studied by mental maps & under geography of mind (Gould).

e.g. Mental map of tajmahal by me.

Thus, regions are crucial in the regional planning & mitigating regional deficiencies.

Feedback

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TOTAL MARKS	

b) Examine the concept of spatial diffusion with reference to agricultural innovations. **(10 Marks)**

Haggerstrand is credited with the concept of diffusion in geographic studies. As the phenomena of movement of Something away from its source of origin.

e.g. Diffusion of population from hearth.

Spatial diffusion involves
- (i) Displacement diffusion
- (ii) Relocation diffusion.

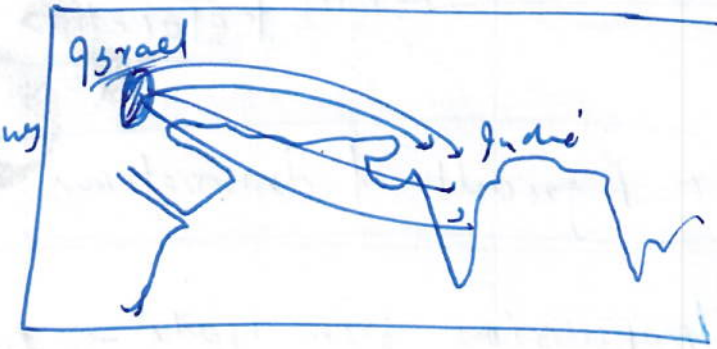
WRT Agricultural innovations

(i) Propulsion from node → for. e.g. the HYV seeds, fertilizers & green revolution diffused from centre of NW India & towards eastern parts as well.

(ii) Diffusion of innovative methods & technologies from → centres of research like Krishi Vikas Kendras, agricultural universities.

(iii) fishing techniques & methods of fish farming with fish seeds in the coastal regions towards hinterland.

(iii) Transborder diffusion → with Israel being prominent in agricultural technologies which were leveraged by India to tackle issues of drylands farming



(iv) Agricultural crops diffuse from Gene Pool centres with colonialists e.g. Potato, Capsicum from Latin America.

Thus, diffusion helps in spatial integration of phenomena for inclusive planning.

Feedback

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TOTAL MARKS	

c) Explain the role of ocean currents in global heat budget. **(10 Marks)**

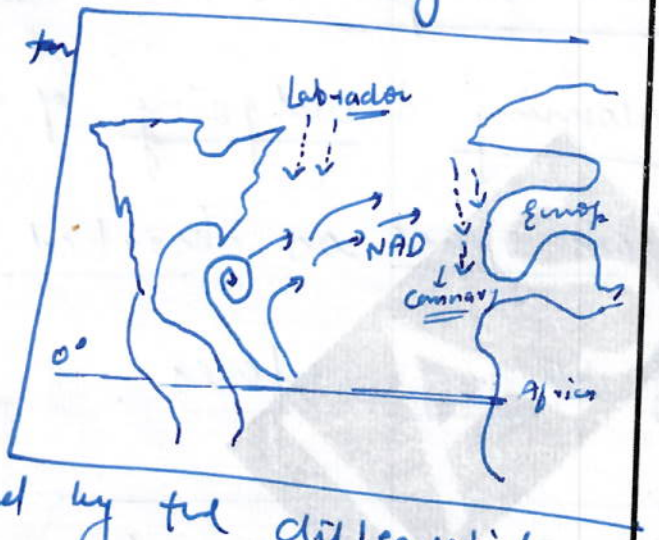
Heat budget is the account of net incoming & outgoing of heat & insolation from space as absorbed & reflected by varying surfaces.

Role of ocean currents

→ Oceans absorbs ~~25~~. maximum of the incoming solar radiations and heat up gradually to maintain the temperature due to specific heat capacity.

(i) Transport to higher latitudes → these masses of moving water from tropics tends to transport warm water to higher latitudes like Gulf Stream or North Atlantic drift in the North atlantic region.

(ii) Cold water to lower latitudes → by cold water currents to balance the heat transfer.



(iii) Thermohaline circulation → caused by the differential levels of temperature & salinity at various depths of oceans causes heat transfer b/w latitudes.

(iii) upwelling & downwelling → as the coastal & mid oceanic phenomena. Upwelling brings the nutrient rich warm water & downwelling leads to sinking of cold water.

(iv) Benthic currents → though slow but seeing changes due to global warming.
like - North Atlantic meridional circulation

Thus, with ocean atmospheric interaction the planet's heat is balanced to avoid any extremes.

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TOTAL MARKS	

d) Discuss the key postulates of Weber's theory of industrial location and its relevance in the digital economy. **(10 Marks)**

Weber propounded his least cost location model of industrial location following an empirical deductive approach as locational analysis theory.

Postulates of Weber's theory & Relevance

(i) Isotrophic plain → with homogenous availability of demand & supply :
Is not fully applicable major semiconductor fabs & ATMPs are located away from the resource rgions like - DRC cobalt.

(ii) Transportation costs → have been significantly reduced with air freight movement, refrigerated vans containers etc.

(iii) Rational economic being → choices are shaped by social media influences, advertisements than rationality solely.

(iv) However, applicable:

↳ location of industries along the agglomeration benefits: e.g. Silicon valley, Bengaluru. benefitting from shared labour pool, freelancing etc.

↳ food processing industries near farm areas. like Mega food parks, Haridwar's pharmaceutical industries research due to nearness to natural resources.

Thus, the postulates of Weber stands applicable in few instances. However with supplementation of evolving trends it can be made more relevant.

e) Describe the major morphological characteristics of world cities. (10 Marks)

As discussed by Mark Jefferson urban settlements are higher hierarchical settlements with greater functional capacity vis-a-vis rural areas. ~50% of world population reside in urban areas.

Major morphological characteristics

(i) Central Business district as the node discussed by Burgess with high functional capacity, land values, skyscrappers, congestion etc.

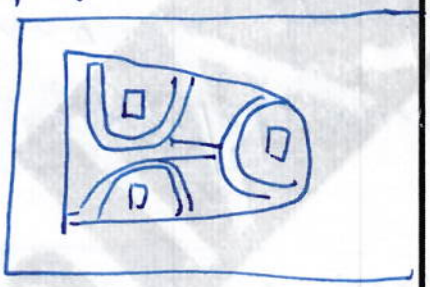
fig: CBD.

(ii) functional aggregation of cities based on industrial, agri residential, administrative units.

e.g. Chandigarh, New York town.

(iii) Multiple nuclei as discussed by Harris & Ullman in 1945 which are centres of growth with both functional specialisation / diversification.

(iv) functional interdependence b/w the urban areas & rural areas as rural urban fringe e.g. BOWASH



(v) Connections & spread of cities outwards functionally as peri urban areas (e.g. Von Thunen's, intensive land use - with market gardening, commercial crops.

Thus, with sustainable urban development & harnessing rural urban continuum (RURBAN) cities can be evolved as centres of growth that helps in regional development

Q.6) a) Discuss the Heartland Theory and critically evaluate its relevance in the 21st-century geopolitical context. **(20 marks)**

Heartland theory was propounded by Halford mackinder in his History & Pivot 1904, later improved, as the Sea based power concept of geopolitical analysis of the world.

Concept of heartland

(i) ~~Earlier~~ - divided world into Heartland, inner crescent, outer crescent with decreasing geopolitical relevance.

(ii) He recognised the World Island as the region of Eurasia & Africa that is of high geopolitic complementarity to heartland.

(iii) Crux of theory :

ep

Who controls Eastern Europe, controls heartland

Who controls heartland, controls the world Island,

Who controls the world Island, controls the world

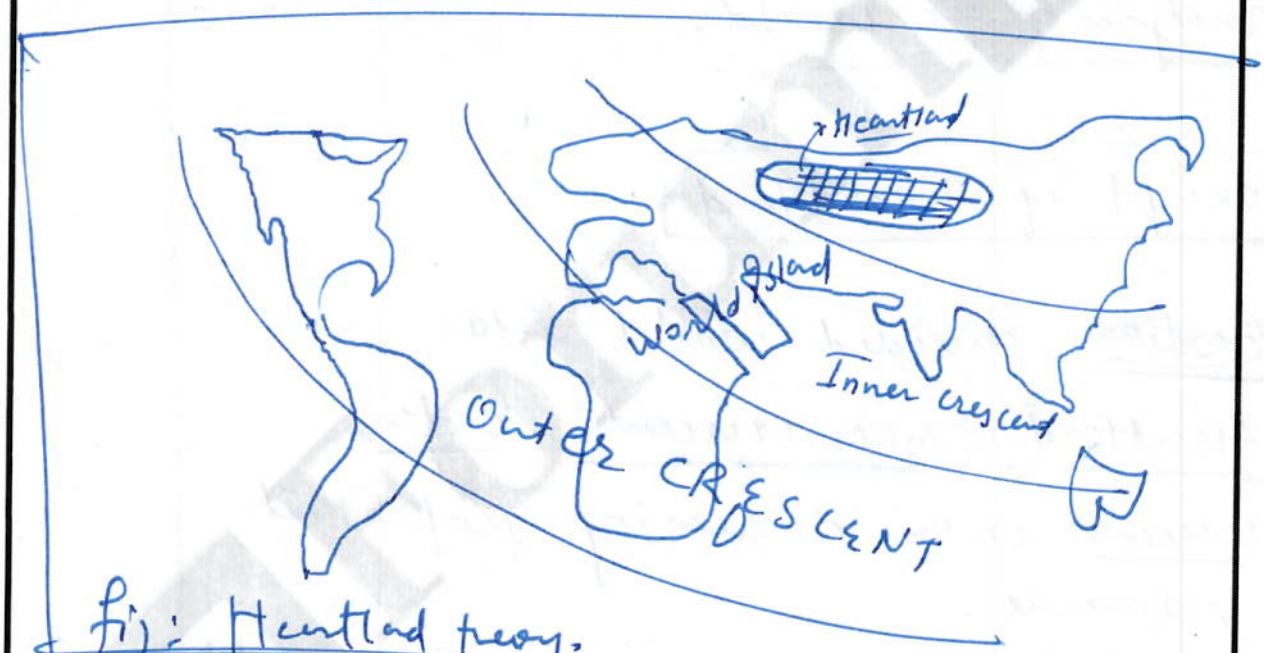


fig: Heartland theory.

* Relevance in 21st century

(B)

(i) ~~Not~~ Applicable today:

↳ (a) NATO expansion in Eastern Europe & Russia Ukraine war since 2022 hints the importance of Easter Europe as the gateway to heartland.

(b) The rising prominence of "world Island" → with land routes, water routes.

↳ china's BRI Projects along silk route.

↳ Eurasia Economic union

↳ INSTC, IMEC can as transport routs to enhance the relevance of integration.

(c) The spill over of geopolitical phenomena to the inner crescent → Middle East (Gaza crisis), & outer crescent → factionalism in Africa.

Not applicable in 21st century :

(i) Mackinder's focus on sea based power only does not hold much water with advent of air power, drones, continental missiles.

(ii) The heartland is largely a zone of adversity (Spykman), seen after fall of USSR.

(iii) Rise of multilateralism & economic interdependence have decentralised the global power to varied centres like - Rise of BRICS & dedollarisation.

Heartland theory can help in understanding the basics of geopolitical organisation globally but could not sufficiently answer the dynamism in geopolitics.

b) Explain the gravity model in the context of population migration. (15 marks)

Migration as discussed by Haggerstrand involves movement of people with twin aspects as – Real & perceptional dimension to both Push & pull factors.

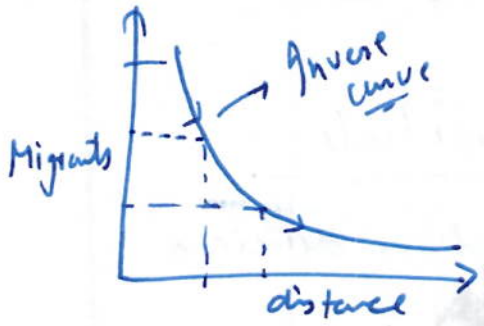
Gravity model

→ Connotes the relative & absolute attraction determining migration decisions to a destination as:

(i) Ravestein's laws + distance decay with increasing distance ~~from~~ the magnitude of the migration also decreases especially among females.

e.g. 2011 census → female migrants main cause was marriage relocation to nearby villages/cities.

(ii) Inverse distance laws of GK Zipf who utilised the gravitational attraction to be dissipating with increase in distance from source to ~~Region~~ destination.



f_{ij} = decreases population.

(iii) Stouffer's law of intervening opportunities: Migration decision are inversely proportional to ~~migrat~~ intervening opportunities in the hierarchy of migration.

(iv) Everet lee's model on migration :

migration is impacted by decisions like

→ pull of the destination, push of the source as (climatic crisis, flood, drought, natural disasters).

(v) Zelensky - Migration transition model especially in context of international migrants → the number decreases with, distance
↳ also increases with functional attraction both real & perceptional : Youth from Gujarat to USA, Punjab to canada, Africans to Europe.

Thus, with evolution in modes & means of transportation & globalisation migration choices have undergone a major shift.

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c) Assess the role of climatic classifications in agricultural planning. (15 marks)

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Q.7) a) Discuss the impact of global warming on the cryosphere, with recent scientific findings. **(20 marks)**

Cryosphere are the regions with ice caps & like glaciers, ice sheets, frozen b earth (permafrost). As per the IPCC AR-6 these are undergoing trasformation due to global warming & climate change.

Impacts of global warming

(i) Melting of ice sheets → observed in the arctic region due to events like arctic amplification, ozone hole depletion & black carbon absorption.

(ii) Antarctic ablation → due to increasing human activities, ocean thermal expansion causing the ice bergs

to break away like in Ross sea region of Antarctica.

(iii) Greenland ice sheets are melting at a rapid rate.

(iv) Thawing of Permafrost regions like USA, Canada & Siberian russia that leads to loosening of geo materials causing increased GHG emissions as: methane & other gas hydrates.

(v) Himalayan glacial ablation → at a rapid rate threatening the lives & livelihoods of >1 Bn population as these are the "water tower of Asia"

(vi) Adverse weather events:

↳ (a) Glacial lake outburst floods
e.g. Dharali village incided

(b) cloud burst in mountain areas.

(c) Coastal submergence & small Islands (e.g Pacific)

(d) release of harmful gases & microbes from the permafrost leading to -ve feedback of GHGs.

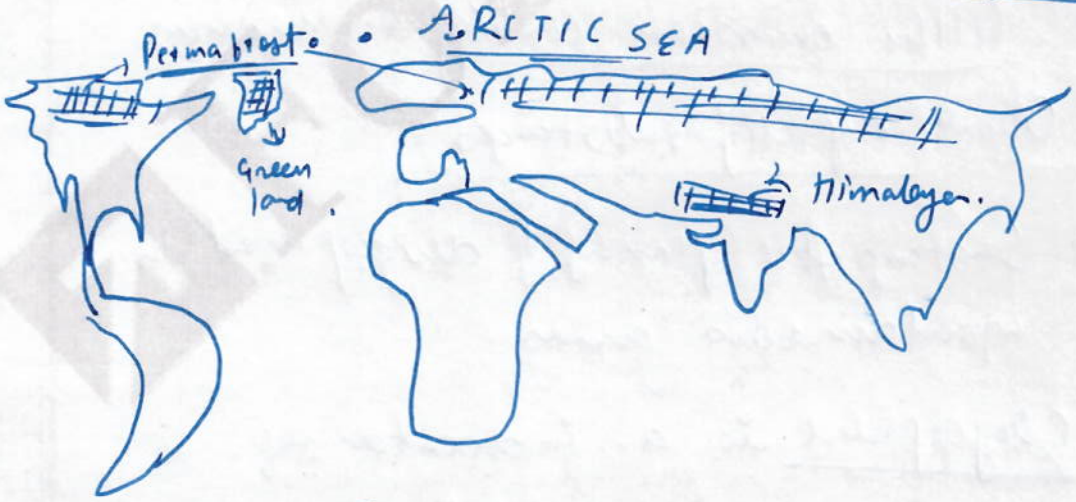

Fig: Cryosphere globally.

Ways to Mitigate

(i) Adherence to climatic goals of temperature reduction under the Paris deal (below 1.5°C by 2100AD)

(ii) Regulating with global treaties for management of Arctic sea region like Arctic council.

(iii) GHGs emissions curbing & reducing Ozone depleting substances.

(iv) Sustainable planning & development in mountainous areas.

Thus, Cryosphere is a indicator of adverse impacts of climate change which needs to be preserved with concerted action, geographical research & planning.

b) Analyse the concept of urban heat island effect and its mitigation strategies.

(15 marks)

Urban heat Island (UHI) is the effect is the meteoric rise in temperature above the urban areas compared to adjacent rural areas with green cover.

i.e. the heat domes over metro cities.

Causes of UHI

(i) Concretisation of the surface with materials like asphalt, tar which increases heat absorption.

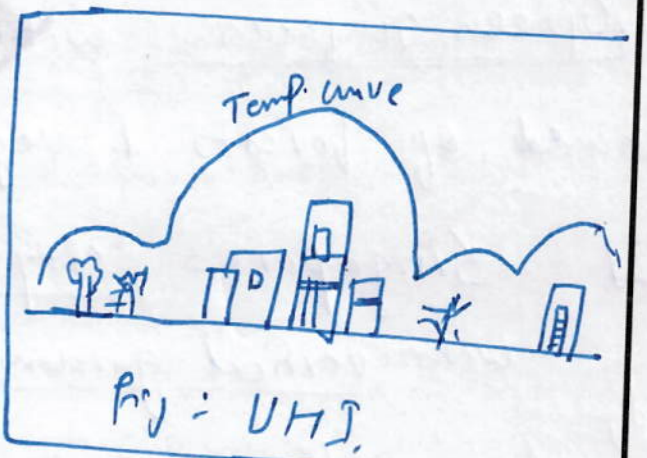

Fig: UHI.

(ii) Depletion of green spaces & urban forestry in the process of expansion of settlements.

(iii) Encroachment of urban commons like wetlands, lakes, ponds, greeneries that provided cooling effect.

(iv) Emission from vehicles & heavy machinaries used in cities, Skyscrappers etc.

Mitigation Strategies

(i) Green Surfaces → with increased share of forests & vegetation.

e.g. Singapore's 'city in garden' with vertical gardens.

Amravati city's plan to reserve 51% of area for green & water spaces.

(ii) Cooling Action plan with revitalization of the natural sources by removing encroachments.
↳ rooftops as cool surfaces.
e.g. Ahemabad's Cooling Plan 2017.

(iii) Public transport promotion and green vehicles that emits less GHGs. thus reduction. "Walk to work" concepts.

(iv) Urban forestry with measures like- Miyawaki methods.

Thus, for sustainable cities (SDG-11) there is need to plans for their growth & expansion in harmony with the natural limitations.

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c) Examine the role of transport networks in regional development. (15 marks)

Transport networks involves varied modes of - road, railways, waterways, airways that can be optimally Mobilised to effect to rgional dwclopmed as discussed by Perroux & Boudville.

Role in rgional development

(i) Acts as agents of growth centres (perroux) with multi modal transport centres like Mughalsarai in, Itarsi in India.

(ii) Spread out effect (Hirschman) of the development & growth to remote rgions like - Western Rajasthan Balotra, Barmer.

(iii) Core - periphery interaction (J. Friedman)
↳ transport corridors help the under & developed regions like - Chota Nagpur industrial belt with ports like Kolkata, Haldia, Vishakhapatnam.

(iv) Bottom-Up development → with mobilisation of regional capacities like in agriculture → textile parks
↳ food processing centres.

(v) Development of Backward & forward linkages as discussed in Regional multiplier model by Hirschman to give effect to regional develpment initiatives.

(vi) Rural - urban continuum → with interaction along ribbons of development as market dependent agri production
↳ Market gardening Zone of Von Thunen.

However Other issues:
↳ Policy frameworks - like SEZs & industries concentration in western parts.
↳ domestic & localised capacities → with human development.
↳ Geography & location → NE & Himalayas in India → rugged undulated.

Thus, with comprehensive Planning with transport corridors equitable, regional development, spatial Planning can be given effect.

Q.8) a) Discuss the evolution of post-modern geography and its critique of positivist approaches.

(20 marks)

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b) Examine the patterns and causes of world population distribution. (15 Marks)

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c) Analyse the significance of hydro-meteorological disasters in shaping development planning. (15 marks)

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