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# **GEOGRAPHY**

## **IAS Mains Q&A**

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# CONTENTS

## PAPER – I

### PRINCIPLES OF GEOGRAPHY

1. Geomorphology -----	1-29
2. Climatology -----	30-55
3. Oceanography -----	56-72
4. Biogeography -----	73-85
5. Environmental Geography -----	86-109
6. Perspectives in Human Geography -----	110-124
7. Economic Geography -----	125-138
8. Population and Settlement Geography -----	139-159
9. Regional Planning -----	160-178
10. Models, Theories and Laws in Human Geography -----	179-201

## PAPER – II

### GEOGRAPHY OF INDIA

1. Map Section -----	204-220
2. Physical Setting -----	221-255
3. Resources -----	256-267
4. Agriculture -----	268-286
5. Industry -----	287-302
6. Transport, Communication and Trade -----	303-315
7. Cultural Setting -----	316-327
8. Settlements -----	328-342
9. Regional Development and Planning -----	343-369
10. Political Aspects -----	370-379
11. Contemporary Issues -----	380-396

## ABOUT THIS BOOK

**Geography-IAS Mains Q&A (2022 Edition)** is revised and updated up to Civil Services Mains Examination 2021. In this book solution to previous 17 years' (2005-2021) papers are segregated into different topics as per the latest syllabus. The wide coverage touches almost all aspects of this subject and serve as good as a valuable study material.

**Answer writing in this book:** We have put forth answers to each question as per the demand of the question. We have adopted an elaborative approach while writing these answers to arm you with relevant knowledge related to all aspects of a particular topic. In most of the answers, we have provided additional information, not necessarily adhering to the prescribed word limit while answering the questions covering all dimensions. This will enrich your knowledge on that topic, enabling you to write better answers in future.

**This book will assist you in answer writing practice in two ways-** use this book as a source of reference/ study material and write answers in your own unique way or alternatively, you may write previous years' answers and compare them with the standard answers provided in this book.

**Importance of Geography as an Optional:** Geography is the most preferred optional subject in UPSC CSE. Around 30% of all candidates who write UPSC Mains take this Optional. This subject is scientific (no rote learning needed), high success ratio, overlaps with prelims syllabus (will help in GS 1, GS 3 and Essay papers). It has an important role to play in preliminary exam as around 15 to 20 questions from Geography are asked every year in prelims. Geography integrates prelims and mains preparation - thus, saving time for other topics.

Optional subject has become the deciding factor in getting an interview call. Though UPSC has introduced four GS papers to give a level playing field to all, the dynamic and unpredictable questions of GS papers defeated the purpose and made Optional paper the magic wand. The toppers' score also tells it loudly that optional subject plays a defining role in determining the selection of the candidates.

So, overall this book is an ideal companion for you going to appear the UPSC Mains examination. It is also equally helpful for State Public Service Examinations and such equivalent examinations where descriptive answers in Geography are asked.

To help the aspirants to get acclimated with the pattern and trend of the exam, this book is a valuable gift to our readers.

We believe that you will find this book very useful while preparing for Main examination. We wish you all the best for your upcoming examinations.

# SYLLABUS: PAPER – I

## Principles of Geography

### Physical Geography

- **Geomorphology:** Factors controlling landform development; endogenetic and exogenetic forces; Origin and evolution of the earth's crust; Fundamentals of geomagnetism; Physical conditions of the earth's interior; Geosynclines; Continental drift; Isostasy; Plate tectonics; Recent views on mountain building; Vulcanicity; Earthquakes and Tsunamis; Concepts of geomorphic cycles and Landscape development ; Denudation chronology; Channel morphology; Erosion surfaces; Slope development; Applied Geomorphology : Geohydrology, economic geology and environment.
- **Climatology:** Temperature and pressure belts of the world; Heat budget of the earth; Atmospheric circulation; atmospheric stability and instability. Planetary and local winds; Monsoons and jet streams; Air masses and frontogenesis, Temperate and tropical cyclones; Types and distribution of precipitation; Weather and Climate; Koppen's, Thornthwaite's and Trewartha's classification of world climates; Hydrological cycle; Global climatic change and role and response of man in climatic changes, Applied climatology and Urban climate.
- **Oceanography:** Bottom topography of the Atlantic, Indian and Pacific Oceans; Temperature and salinity of the oceans; Heat and salt budgets, Ocean deposits; Waves, currents and tides; Marine resources: biotic, mineral and energy resources; Coral reefs, coral bleaching; sea level changes; law of the sea and marine pollution.
- **Biogeography:** Genesis of soils; Classification and distribution of soils; Soil profile; Soil erosion, Degradation, and conservation; Factors influencing world distribution of plants and animals; Problems of deforestation and conservation measures; Social forestry; agro-forestry; Wildlife; Major gene pool centers.
- **Environmental Geography:** Principle of ecology; Human ecological adaptations; Influence of man on ecology and environment; Global and regional ecological changes and imbalances; Ecosystem their management and conservation; Environmental degradation, management, and conservation; Biodiversity and sustainable development; Environmental policy; The Environmental hazards and remedial measures; Environmental education and legislation.

### Human Geography

- **Perspectives in Human Geography:** Areal differentiation; regional synthesis; Dichotomy and dualism; Environmentalism; Quantitative revolution and locational analysis; radical, behavioral, human and welfare approaches; Languages, spirituality, and secularisation; Cultural regions of the world; Human development index.
- **Economic Geography:** World economic development: measurement and problems; World resources and their distribution; Energy crisis; the limits to growth; World agriculture: typology of agricultural regions; agricultural inputs and productivity; Food and nutrition problems; Food security; famine: causes, effects and remedies; World industries: locational patterns and problems; patterns of world trade.
- **Population and Settlement Geography:** Growth and distribution of world population; demographic attributes; Causes and consequences of migration; concepts of the over-under-and optimum population; Population theories, world population problems and policies, Social well-being and quality of life; Population as social capital. Types and patterns of rural settlements; Environmental issues in rural settlements; Hierarchy of urban settlements; Urban morphology: Concepts of primate city and rank-size rule; Functional classification of

towns; Sphere of urban influence; Rural-urban fringe; Satellite towns; Problems and remedies of urbanization; Sustainable development of cities.

- **Regional Planning:** Concept of a region; Types of regions and methods of regionalization; Growth centers and growth poles; Regional imbalances; regional development strategies; environmental issues in regional planning; Planning for sustainable development.
- **Models, Theories and Laws in Human Geography:** Systems analysis in Human geography; Malthusian, Marxian and demographic transition models; Central Place theories of Christaller and Losch; Perroux and Boudeville; Von Thunen's model of agricultural location; Weber's model of industrial location; Ostrov's model of stages of growth. Heartland and Rimland theories; Laws of international boundaries and frontiers.

## SYLLABUS: PAPER – II

### Geography of India

- **Physical Setting:** Space relationship of India with neighboring countries; Structure and relief; Drainage system and watersheds; Physiographic regions; Mechanism of Indian monsoons and rainfall patterns, Tropical cyclones, and western disturbances; Floods and droughts; Climatic regions; Natural vegetation; Soil types and their distributions.
- **Resources:** Land, surface and groundwater, energy, minerals, biotic and marine resources; Forest and wildlife resources and their conservation; Energy crisis.
- **Agriculture:** Infrastructure: irrigation, seeds, fertilizers, power; Institutional factors: land holdings, land tenure and land reforms; Cropping pattern, agricultural productivity, agricultural intensity, crop combination, land capability; Agro and social-forestry; Green revolution and its socio-economic and ecological implications; Significance of dry farming; Livestock resources and white revolution; aquaculture; sericulture, apiculture and poultry; agricultural regionalisation; agro-climatic zones; agro-ecological regions.
- **Industry:** Evolution of industries; Locational factors of cotton, jute, textile, iron and steel, aluminium, fertilizer, paper, chemical and pharmaceutical, automobile, cottage and agro-based industries; Industrial houses and complexes including public sector undertakings; Industrial regionalisation; New industrial policies; Multinationals and liberalization; Special Economic Zones; Tourism including eco-tourism.
- **Transport, Communication and Trade:** Road, railway, waterway, airway and pipeline networks and their complementary roles in regional development; Growing importance of ports on national and foreign trade; Trade balance; Trade Policy; Export processing zones; Developments in communication and information technology and their impacts on economy and society; Indian space programme.
- **Cultural Setting:** Historical Perspective of Indian Society; Racial, linguistic and ethnic diversities; religious minorities; major tribes, tribal areas and their problems; cultural regions; Growth, distribution and density of population; Demographic attributes: sex-ratio, age structure, literacy rate, work-force, dependency ratio, longevity; migration (inter-regional, intraregional and international) and associated problems; Population problems and policies; Health indicators.
- **Settlements:** Types, patterns, and morphology of rural settlements; Urban developments; Morphology of Indian cities; Functional classification of Indian cities; Conurbations and metropolitan regions; urban sprawl; Slums and associated problems; town planning; Problems of urbanization and remedies.

- **Regional Development and Planning:** Experience of regional planning in India; Five Year Plans; Integrated rural development programmes; Panchayati Raj and decentralized planning; Command area development; Watershed management; Planning for backward area, desert, drought-prone, hill, tribal area development; multi-level planning; Regional planning and development of island territories.
- **Political Aspects:** the Geographical basis of Indian federalism; State reorganization; Emergence of new states; Regional consciousness and interstate issues; international boundary of India and related issues; Cross-border terrorism; India's role in world affairs; Geopolitics of South Asia and Indian Ocean Realm.
- **Contemporary Issues: Ecological issues:** Environmental hazards: landslides, earthquakes, Tsunamis, floods and droughts, epidemics; Issues relating to environmental pollution; Changes in patterns of land use; Principles of environmental impact assessment and environmental management; Population explosion and food security; Environmental degradation; Deforestation, desertification and soil erosion; Problems of agrarian and industrial unrest; Regional disparities in economic development; Concept of sustainable growth and development; Environmental awareness; Linkage of rivers; Globalisation and Indian economy.

*NOTE:* Candidates will be required to answer one compulsory map question pertinent to subjects covered by this paper.



**PAPER-I**

**PRINCIPLES OF GEOGRAPHY**

**Physical Geography**

Geomorphology

Climatology

Oceanography

Biogeography

Environmental Geography

**Human Geography**

Perspectives in Human Geography

Economic Geography

Population and Settlement Geography

Regional Geography

Models, Theories and Laws in Human Geography



## GEMORPHOLOGY

**Q. The concept of plate tectonics has been derived from the isostasy and continental drift theory. Elaborate citing suitable examples.**

**(CSE 2021)**

**Ans:** The modern concept Plate tectonic theory was postulated in 1960'. It is based on the understanding of various theories argued earlier to explain the movement of earth crust.

- For the first time in 1915 crustal movement was proposed by Alfred Wegener in his theory of "continental drift." Wegener proposed that the continents float over the heavier matter underlying it. This is why continents were once united into a single supercontinent named Pangaea, meaning all earth in ancient Greek. He suggested that Pangaea broke up long ago and that the continents then moved to their current positions. He called his hypothesis continental drift.
- He argued this on the basis of several evidences as follows:
  1. Identical rocks of the same type and age are found on both sides of the Atlantic Ocean. Wegener said the rocks had formed side-by-side and that the land had since moved apart.
  2. Mountain ranges with the same rock types, structures, and ages are now on opposite sides of the Atlantic Ocean.
  3. The Appalachians of the eastern United States and Canada, for example, are just like mountain ranges in eastern Greenland, Ireland, Great Britain, and Norway. Wegener concluded that they formed as a single mountain range that was separated as the continents drifted.
  4. Ancient fossils of the same species of extinct plants and animals are found in rocks of the same age but are on continents that are now widely separated. Wegener proposed that the organisms had lived side by side, but that the lands had moved apart after they were dead and fossilized.

However, Wegener failed to explain the reason of continent floating over earth. He didn't have an explanation for why and how the continents moved. Later several theories like sea floor spreading, paleomagnetism, isostasy built the understanding of crustal movement over heavier underlying matter.

The concept of isostasy later explains lighter element float over denser material. The theory argued that lighter crust must be floating on the denser underlying mantle. It also explained how different topographic heights can exist on the Earth's surface on the basis of Isostatic equilibrium. Therefore, understanding the dynamics of isostasy helps us figure out more complex phenomena such as mountain building, sedimentary basin formation, and the break-up of continents and the formation of new ocean basins.

Starting from the development of continental drift theories, later several theories such as sea floor spreading, isostasy and understanding of asthenosphere lead to the development of modern plate tectonic theory. Since its emergence in the 1960's, plate tectonic theory has gained wide-spread acceptance as the model of Earth processes.

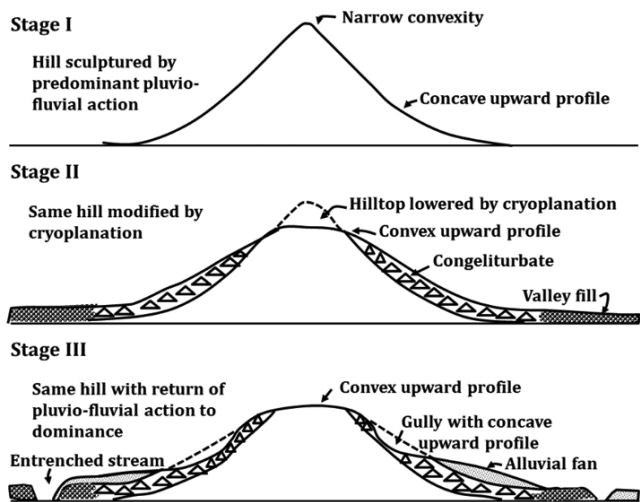
**Q. Describe the concept of 'Altiplanation'.**

**(CSE 2021)**

**Ans:** In geomorphology, altiplanation or cryoplanation refers to process of relief reduction or gradual planation (i.e., the smoothing of the surface) under periglacial conditions.

- **Two mechanisms are involved under altiplanation:**
  1. the destruction of upstanding relief features by frost wedging or nivation, and
  2. the accumulation of debris in depressions or as terraces.

The gradual accumulation debris leads to altiplanation terraces. In many areas where only partial altiplanation has been achieved, there altiplanation terraces are noticeable such as those of Cox Tor on Dartmoor, England.



Terraces formed by altiplanation or cryoplanation are called altiplanation terraces. Altiplanation landforms are characterized by terraces as gently inclined or nearly horizontal bedrock-cut benches on slopes, spurs and on broad interfluves that are formed by the parallel retreat of steeper slope segments under periglacial conditions.

Additionally, with the effect of altiplanation process on the landscape, the vegetation on these frost-altered terraces is also reshaped. The vegetation tends to be uniquely uniform both laterally and vertically.

This unique periglacial landforms based on freeze-thaw cycle are customarily found in Arctic periglacial regions of Eastern Siberia and Alaska. They may also be found in areas that currently or have sometime in the past experienced intense seasonal freezing or permafrost.

**Q. Why is mapping important for analysing geo-hydrological investigations? Explain with relevant examples. (CSE 2020)**

**Ans:** Geohydrology is the study of groundwater – it is sometimes referred to as Hydrogeology or groundwater hydrology. Hydrogeology deals with how water gets into the ground (recharge), how it flows in the subsurface (through aquifers) and how groundwater interacts with the surrounding soil and rock (the geology).

- Hydrogeologists are involved in attempting to solve some of the big questions facing the world today, including sustainable water supply, food and energy production; environmental protection; and coping with climate change.

**Mapping is important for analysing geo-hydrological investigation as it will help in various aspects such as:**

- Design and construct water wells for drinking water supply, irrigation schemes and other purposes;

- Try to discover how much water is available to sustain water supplies so that these do not adversely affect the environment – for example, by depleting natural base flows to rivers and important wetland ecosystems;
- Investigate the quality of the water to ensure that it is fit for its intended use. Example Lower Ganga underground water contaminated with arsenic due to over exploitation.
- Where the groundwater is polluted, they design schemes to try and clean up this pollution;
- Design construction dewatering schemes and deal with groundwater problems associated with mining;
- Help to harness geothermal energy through groundwater-based heat pumps.

That’s why mapping is important and this can help to end or curb future water crisis on the earth.

**Q. Write an essay on the evolution of the continents and oceans using various theories and models. (CSE 2020)**

**Ans:** There are mainly three theories and models which help to explain the formation of continents and oceans - inhomogeneous model, Impact model, and terrestrial model.

- Inhomogeneous Model:** The inhomogeneous model or the so-called the accretion model explains that the Earth’s crust was formed during the accretion of the planet, with lighter and volatile elements forming a thin layer on the primitive planet which became the crust. This model suggests that non-volatile elements can only be found in the mantle; however, this is not true. Non-volatile elements such as uranium and thorium are found on the Earth’s crust, making this theory highly unlikely.
- Impact Model:** The impact model suggests that asteroids and other objects that impacted Earth melted and formed the crust. The oceanic crust, which is mainly composed of basalt, could have been formed by a basalt asteroid that impacted the Earth. However, from the observations of the moon, basalts found in lunar maria were not due to an asteroid collision. Furthermore, the number of basalts produced from an impact event was too insignificant to form crusts. In addition, a majority of the impact events on Earth happened after oceanic crusts were formed. Therefore, this theory is also unlikely as well.
- Terrestrial Model:** The terrestrial model is the most likely explanation on the formation of the Earth’s crust. This model explains that the crustal origin of the Earth was due to its internal processes. After the late accretion of the Earth, heat retained by the Earth

**Q. Indicating the causes of lightning, describe the threats associated with it. (CSE 2021)**

**Ans:** Lightning is weather-related disaster associated with thunderstorms.

When the ground is hot, it heats the air above it. This warm air rises. As the air rises, water vapor cools and forms a cloud. When air continues to rise, the cloud gets bigger and bigger. In the tops of the clouds, temperature is below freezing and the water vapor turns into ice. After, the cloud becomes a thundercloud. Lots of small bits of ice bump into each other as they move around. All these collisions cause a buildup of electrical charge. Eventually, the whole cloud fills up with electrical charges. Lighter, positively charged particles form at the top of the cloud. Heavier, negatively charged particles sink to the bottom of the cloud.

When the positive and negative charges grow large enough, a giant spark - lightning - occurs between the two charges within the cloud. Most lightning happens inside a cloud, but sometimes it happens between the cloud and the ground.

A buildup of positive charge builds up on the ground beneath the cloud, attracted to the negative charge in the bottom of the cloud. The ground's positive charge concentrates around anything that sticks up such as trees, lightning conductors, even people. The positive charge from the ground connects with the negative charge from the clouds and a spark of lightning strikes.

There are several threats associated with lightning as follows:

1. Lightning is also a major cause of electrical power breakdowns and forest fires.
2. It can also damage communication and computer equipment and affect aircraft navigation systems.
3. A moderate lightning and thunderstorm can damage thatched huts, kutcha roads, standing crops, orchards, and power and communication lines.
4. A severe lightning and thunderstorm can cause major damage to thatched houses/ huts.

Rooftops may also blow off. Unattached or loosely tied metal sheets may fly.

5. It can also damage power and communication lines as well as roads, besides flooding of escape routes, breaking of tree branches, uprooting of large trees, etc.

In India, on an average, more than 2,500 deaths are recorded due to thunderstorm and lightning every year. It accounted for about 39 per cent of deaths from natural disasters in the country from 1967 to 2012.

During May 2018, severe dust storms, thunderstorms and lightning hit several parts of India, resulting in a large number of deaths and injuries across Rajasthan, Uttar Pradesh, Telangana, Uttarakhand and Punjab.

**Q. Examine major influencing factors for varied patterns of precipitations on the continents. (CSE 2021)**

**Ans:** Precipitation is any liquid or frozen water that forms in the atmosphere and falls back to the Earth. It comes in many forms, like rain, sleet, and snow. There are several factors which contribute to precipitation such as water in atmosphere, wind, mountains etc.

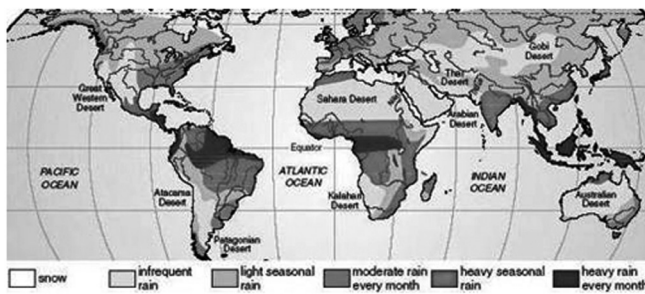
Since all these factors vary from one place to other. Therefore, different places on the earth's surface receive different amounts of rainfall in a year and that too in different seasons.

In general, as we proceed from the equator towards the poles, rainfall goes on decreasing steadily. For example, Brazil, Congo, south east nations receive rainfall throughout the year. The coastal areas of the world receive greater amounts of rainfall than the interior of the continents this is due to direct impact of onshore winds. The rainfall is more over the oceans than on the landmasses of the world because of being great sources of water.

Between the latitudes 35° and 40° N and S of the equator, the rain is heavier on the eastern coasts and goes on decreasing towards the west. For example, part of eastern coast of China and Gulf of Mexico receives more rainfall under the influence of easterlies.

But, between 45° and 65° N and S of the equator, due to the westerlies, the rainfall is first received on the western margins of the continents and it goes on decreasing towards the east. For example, North-West Europe (northern and western France, Belgium, the Netherlands, Denmark, western Norway and also north-western Iberia) receives rainfall throughout the year due to influence of westerlies and frontal formation.

Wherever mountains run parallel to the coast, the rain is greater on the coastal plain, on the windward side and it decreases towards the leeward side. The classic example is Western Ghats which receives high rainfall in comparison to other parts of Indian sub-continent.



Thus, we can say rainfall is not uniform and it varies from one place to other due to various factors.

Also, On the basis of the total amount of annual precipitation, major precipitation regimes of the world are identified as follows.

1. The equatorial belt
2. The windward slopes of the mountains along the western coasts in the cool temperate zone and the coastal areas of the monsoon land receive heavy rainfall of over 200 cm per annum.
3. Interior continental areas receive moderate rainfall varying from 100 – 200 cm per annum.
4. The coastal areas of the continents receive the moderate amount of rainfall.
5. The central parts of the tropical land and the eastern and interior parts of the temperate lands receive rainfall varying between 50 -100 cm per annum.
6. Areas lying in the rain shadow zone of the interior of the continents and high latitudes receive very low rainfall-less than 50 cm per annum.
7. Seasonal distribution of rainfall provides an important aspect to judge its effectiveness. In some regions, rainfall is distributed evenly throughout the year such as in the equatorial belt and in the western parts of cool temperate regions.

**Q. What are the important factors responsible for air mass modifications? (CSE 2021)**

**Ans:** An air mass is a large mass of air that has similar characteristics of temperature and humidity within it. An air mass acquires these characteristics above an area of land or water known as its **source region**.

When the air mass sits over a region for several days, or longer, it picks up the distinct temperature and humidity characteristics of that region. Where an air mass receives its characteristics of temperature and humidity is called the source region.

**Categorization of Air Masses**

Meteorologists classify air masses based on where they are formed. Here is the classification.

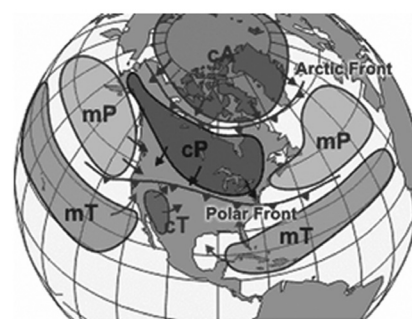
Typically, there are 4 types of air masses:

- (i) **Arctic:** These air masses form over Arctic region and have very low temperature and humidity.
- (ii) **Tropical:** These air masses form over the tropical region and are warm up to a moderate level.
- (iii) **Polar:** These air masses form in the high-latitude region below the arctic and are very cold in nature.

(iv) **Equatorial:** They start forming over the Equator and are warm.

Along with this classification, Meteorologists classify them on the basis of whether they form over continent or ocean. Accordingly, air masses classified as:

- **Maritime:** Maritime airmass form over the ocean and have high moisture.
- **Continental:** Whereas, the Continental airmass form over the land and are arid.



For instance, an air mass formed over Canada is a continental polar air mass that is cold and dry. However, one that is formed over the tropical pacific is maritime tropical airmass that is humid and warm.

Also, air masses under the influence of planetary winds move away from their source region. As air mass moves from its source region the air is modified due to variations in the nature of the underlying surface.

Two processes, acting either independently or together, may modify an air mass.

**PAPER-II**  
**GEOGRAPHY OF INDIA**

India Maps

Physical Setting

Resources

Agriculture

Industry

Transport, Communication and Trade

Cultural Setting

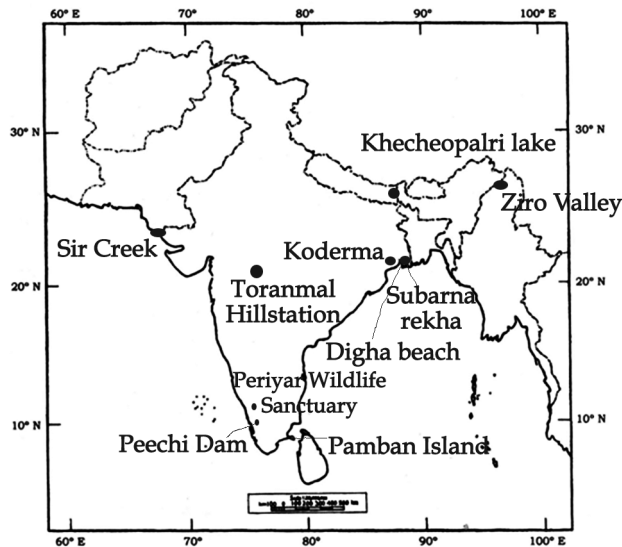
Settlements

Regional Development and Planning

Political Aspects

Contemporary Issues

Q. On the outline map of India, mark the location of all the following. Write the significance of these locations whether physical/ commercial/ economic/ ecological/ environmental/ cultural, in not more than 30 words for each entry:



- (i) Ziro Valley
- (ii) Khecheopalri Lake
- (iii) Toranmal
- (iv) Subarnarekha River
- (v) Koderma
- (vi) Sir Creek
- (vii) Periyar Wildlife Sanctuary
- (viii) Peechi Dam
- (ix) Digha Beach
- (x) Pamban Island

(CSE 2021)

Ans. (i) **Ziro Valley:** Ziro is the district headquarters of Lower Subansiri district and is one of the oldest towns in Arunachal Pradesh. Climatic conditions vary from

subtropical to temperate. Apatani culture is dominant in this region. They speak a local language called Tani and worship the sun and the moon. They follow a sustainable social forestry system.

(ii) **Khecheopalri Lake:** Originally known as Kha-Chot-Palri (meaning the heaven of Padmasambhava), is a lake located near Khecheopalri village, 147 kilometres (91 mi) west of Gangtok in the West Sikkim district of the Northeastern Indian state of Sikkim. The Khecheopalri Lake and the Khangchendzonga National Park are conserved from the biodiversity perspective with ecotourism and pilgrimage as essential offshoots.

(iii) **Toranmal:** It is a Hill Station in the municipal council of the Nandurbar district in the Indian state of Maharashtra. It is a hill station located in the Satpura Range. Its Gorakhnath Temple is the famous site located here.

(iv) **Subarnarekha River:** After originating near piska/nagri, near Ranchi, the capital of Jharkhand. The Subarnarekha traverses a long distance through Ranchi, Seraikela Kharsawan and East Singhbhum districts in the state. Thereafter, it flows for shorter distances through Paschim Medinipur district in West Bengal and Balasore district of Odisha. There, it flows for 79 kilometres and joins the Bay of Bengal near Talsari. It has two multipurpose projects.

(v) **Koderma:** Koderma is bordered by Nawada district of Bihar on the north, the Gaya district of Bihar on the west, the Giridih district of Jharkhand on the east, and the Hazaribagh district of Jharkhand on the south. Koderma district is richly endowed with natural resources. Quartz, feldspar, asbestos, blue stone, white stone and moon stone are the minerals found here. At one time, Koderma was considered as the mica capital of India.

(vi) **Sir Creek:** Sir Creek is a 96-km strip of water disputed between India and Pakistan in the Rann of Kutch marshlands. Originally named Ban Ganga, Sir Creek is named after a British representative.

## PHYSICAL SETTING

**Q. Discuss the economic significance of the volcanic soils of India. (CSE 2021)**

**Ans:** Volcanic soils, also known as Andisols, are formed from volcanic ash and cinder deposits. Volcanic soils largely consist of non-crystalline (amorphous) minerals, such as allophone and imogolite. These minerals form strong bonds with organic matter. As a result, organic matter generally accumulates in the surface horizon. In addition to organic matter, volcanic soils may also contain high amounts of volcanic glass material with the possibility of amorphous iron and aluminum minerals.



Black soil covers most of the Deccan Plateau which includes parts of Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh and some parts of Tamil Nadu. In the upper reaches of the Godavari and the Krishna, and the north western part of the Deccan Plateau, the black soil is very deep. These soils are also known as the 'Regur Soil' or the 'Black Cotton Soil'.

**Economic Significance of Soil**

- The black soils are generally clayey, deep and impermeable. They swell and become sticky when wet and shrink when dried. So, during the dry season, these soils develop wide cracks. Thus, there occurs a kind of 'self ploughing'. Because of this character of slow absorption and loss of moisture, the black soil retains the moisture for a very long time, which helps the crops, especially; the rain fed ones, to sustain even during the dry season.
- Chemically, the black soils are rich in lime, iron, magnesia and alumina. They also contain potash. But they lack in phosphorous, nitrogen and organic matter. The colour of the soil ranges from deep black to grey.
- Therefore black soil has water retentive capacity and high nutrient content.
- Because of their high fertility and retentivity of moisture, the black soils are generally used for producing several important crops. Some of the main crops grown on the black soils are cotton, wheat, jowar, linseed, Virginia tobacco, castor, sunflower, and millets.
- Rice and sugarcane are equally important where irrigation facilities are obtainable. Large varieties of vegetables and fruits are successfully grown on black soil.

**Q. Describe the salient features of the east-flowing rivers of India. (CSE 2021)**

**Ans:** Rivers have been of fundamental importance throughout human history. Water from rivers is a basic natural resource, essential for survival and development of human being. Therefore, riverbanks have attracted settlers from ancient times.

Rivers have several utility such as irrigation, navigation, and hydropower generation etc. India is endowed with several rivers drains either in east or in west.

Some of the important east flowing rivers are Godavari, Krishna, Cauvery, Mahanadi, Pennar, Subarnarekha, Brahmani, Ponnaiyar, Vaigai River, etc.

**East flowing rivers in comparison to west flowing rivers:**

- flow into the Bay of Bengal
- have many tributaries
- forms Deltas
- larger basin in comparison to west flowing
- Carry larger sediments than west flowing

**Krishna:** The Krishna is the second largest east-flowing Peninsular River which rises near Mahabaleshwar in Sahyadri. Its total length is 1,401 km. The Koyna, the Tungbhadra and the Bhima are its major tributaries.



**Pennar:** The Pennar rises in the Chennakasava hill of the Nandidurg range, in Chikkaballapura district of Karnataka, and flows towards the east eventually draining into the Bay of Bengal. The total length of the river from origin to its outfall in the Bay of Bengal is 597 km. Located in peninsular India, the Pennar basin extends over states of Andhra Pradesh and Karnataka having an area of ~55 thousand Sq.km. Its important tributaries are the Jayamangali, the Kunderu on Left Bank Chiravati, the Papagni on right bank.

**Palar:** Palar is a river of southern India. It rises in the Nandi Hills in Chikkaballapura district of Karnataka state and flows in Karnataka, Andhra Pradesh, and Tamil Nadu before reaching its confluence into the Bay of Bengal at Vayalur. The Cheyyar and the Ponnai in Tamil Nadu are the major tributaries of this river Palar.

**Subarnarekha:** The Subarnarekha originates from the Ranchi Plateau in Jharkhand forming the boundary between West Bengal and Odisha in its lower course. It joins the Bay of Bengal forming an estuary between the Ganga and Mahanadi deltas. Its total length is 395 km.

**Brahmani:** The Brahmani River comes into existence by the confluence of the Koel and the Sankh

rivers near Rourkela. It has a total length of 800 km. The basin flows through Jharkhand, Chhattisgarh, and the Orissa States and drains into the Bay of Bengal. Together with the river Baitarani, it forms a large delta before emptying into the Bay of Bengal at Dhamra.

**Q. Explain the impact of tropical cyclones and western disturbances on the climate of India. (CSE 2021)**

**Ans:** Cyclones are caused by atmospheric disturbances around a low-pressure area distinguished by swift and often destructive air circulation.

Cyclones are usually accompanied by violent storms and bad weather. The air circulates inward in an anticlockwise direction in the Northern hemisphere and clockwise in the Southern hemisphere.

**Cyclones are classified as:**

- Extra tropical cyclones occur in temperate zones and high latitude regions, though they are known to originate in the Polar Regions.
- Tropical cyclone - Cyclones that develop in the regions between the Tropics of Capricorn and Cancer are called tropical cyclones. Tropical cyclones are large-scale weather systems developing over tropical or subtropical waters, where they get organized into surface wind circulation.

The conditions favorable for the formation and intensification of tropical storms are:

- Large sea surface with temperature higher than 27° C;
- Presence of the Coriolis force;
- Small variations in the vertical wind speed;
- A pre-existing weak low-pressure area or low-level-cyclonic circulation;
- Upper divergence above the sea level system

**Climate of India**

The Indian subcontinent is one of the worst affected regions in the world. The subcontinent with a long coastline of 8041 kilometers is exposed to nearly 10 per cent of the world's tropical cyclones. Of these, the majority of them have their initial genesis over the Bay of Bengal and strike the East coast of India. On an average, five to six tropical cyclones form every year, of which two or three could be severe. More cyclones occur in the Bay of Bengal than the Arabian Sea and the ratio is approximately 4:1.

They have potential impact on climatic condition. Tropical cyclone originated during the month of June and July enter Indian subcontinent after embedding into easterlies jet stream.