

PAPER 2 GEOGRAPHY OPTIONAL

On the outline map of India provided to you, mark the location of all of the following. Write in your OCA Booklet the significance of these locations, whether physical/commercial/economic/ecological/ environmental/cultural, in not more than 2x10=20 30 words for each entry

1) RUSHIKULIYA RIVER

Geographical & Ecological Significance

- Agriculture: The Rushikulya basin is fertile and supports cultivation of paddy, sugarcane, and pulses.
- Ecology: The Rushikulya river mouth is one of the world's largest olive ridley sea turtle nesting sites (mass nesting known as *arribada*).
- No large delta: Unlike other east-flowing rivers of Odisha, it forms only a small estuary.

Major Tributaries

- Baghua
- Dharini
- Badanadi
- Ghodahada

Nearby Towns & Places

- Bhanjanagar
- Aska
- Ganjam
- Purusottampur

Irrigation & Hydrology

- Important for irrigation in Ganjam district.
- Supports several canals and minor irrigation projects.

If you want, I can also provide:

- A detailed map-like description
- Economic importance
- Environmental issues
- Comparison with other Odisha rivers

2) DATAR HILLS

The **Datar Hills**, also called the *Daringbadi or Datar region* in some contexts, are part of the **Eastern Ghats** in Odisha and form an important highland area known for their scenic beauty and ecological significance. These hills, rising to considerable elevations, are covered with dense forests of sal and other tropical species. The area experiences a cooler climate compared to the surrounding plains, earning it the nickname “**Kashmir of Odisha.**” Numerous small streams originate from these hills, eventually joining major rivers such as the Rushikulya. The region is inhabited by tribal communities whose culture, agriculture, and lifestyle are closely linked to the forest and hill ecosystem. Rich in biodiversity, the Datar Hills support wildlife like elephants, deer, and various bird species, making them both environmentally important and a growing destination for eco-tourism.

3) **Kikruma**

kikruma is a prominent village located in the **Phek district of Nagaland**, known for its rich history, traditional practices, and scenic landscape. Situated in the hilly terrain of the region, the village is home to the **Chakhesang Naga** community, whose culture is reflected in their festivals, architecture, and community life. Kikruma is especially noted for its unique “**terraced paddy fields**”, an indigenous agricultural system that allows villagers to cultivate rice efficiently on steep slopes. The village is also known for its strong sense of social cohesion and traditional self-governance, which continues to guide everyday life. Surrounded by lush greenery, cool climate, and vibrant

cultural heritage, Kikruma stands as a significant example of sustainable living and community-driven development in Nagaland.

4) CHOTIRAND TILLAYA

Choritand–Tillaya is a small but notable geographical area located in the **Koderma district of Jharkhand**, India. The region is known for its **Tillaya Dam**, built on the **Barakar River**, which plays an important role in irrigation and local water management. Surrounded by low hills, forests, and rural settlements, Choritand–Tillaya reflects the natural landscape of the Chota Nagpur Plateau. The dam and its reservoir create a scenic environment that supports agriculture, fishing, and daily needs of nearby villages. The area is also environmentally significant, with rich biodiversity and a mix of tribal and non-tribal communities whose livelihoods are closely linked to the land and water resources.

5) BYALALU

Byalalu is a village located on the outskirts of **Bengaluru (Bangalore)** in **Ramanagara district, Karnataka**, and is best known for hosting the **Indian Deep Space Network (IDSN)** of ISRO. This high-tech facility, equipped with large parabolic antennas, is responsible for tracking and communicating with India's deep-space missions such as Chandrayaan and Mangalyaan. Despite its global scientific importance, Byalalu itself retains a rural character, surrounded by rocky hills, farmlands, and traditional settlements typical of the region. The presence of ISRO has brought national attention to the village, making it a unique blend of quiet rural life and advanced space-science infrastructure.

6) NEYYAR

Neyyar is a river and reservoir region in **southern Kerala**, known for its natural beauty, biodiversity, and ecological importance. The **Neyyar River** rises from the **Agasthyamalai hills** of the Western Ghats and flows through Thiruvananthapuram district before reaching the Arabian Sea. Along its course lies the **Neyyar Dam**, which forms a large, picturesque reservoir that supports irrigation, drinking water supply, and recreational activities. The area around the dam is protected as the **Neyyar Wildlife Sanctuary**, home to elephants, deer, gaur, lion-tailed macaques, and many bird species. With trekking trails, a Lion Safari Park, and serene forested landscapes, Neyyar stands out as an important ecological zone as well as a popular destination for nature tourism in Kerala.

7) UTTARLAI

Uttarlai is a small town located in the **Barmer district of Rajasthan**, best known for housing one of the important **Indian Air Force (IAF) airbases** in western India. Situated in the arid landscape of the Thar Desert, Uttarlai holds strategic significance due to its proximity to the India–Pakistan border. The region is characterized by sandy terrain, sparse vegetation, and extreme climatic conditions typical of the desert environment. Despite its remote setting, the presence of the airbase has brought infrastructure and connectivity to the area. Uttarlai also reflects the traditional culture of western Rajasthan, with local settlements showcasing desert architecture, vibrant attire, and a lifestyle shaped by the harsh climate.

8) Srivijayapuram

IT is a village located in the **Tirupati district of Andhra Pradesh**, known for its rural landscape, traditional farming practices, and peaceful environment. Surrounded by fields, small water bodies, and gentle hills, the area reflects the typical agrarian setting of southern Andhra Pradesh. The community here is largely engaged in agriculture, growing crops such as paddy, sugarcane, and groundnut. Srivijayapuram is also connected to nearby towns through local roads, giving residents access to markets, schools, and basic services while still retaining a calm village atmosphere. Its cultural life is shaped by local festivals, temple traditions, and community gatherings, making Srivijayapuram a blend of natural charm and rural heritage.

9) DHARWAS

Dharwas is a remote and picturesque village located in the **Pangi Valley of Chamba district, Himachal Pradesh**. Known for its dramatic mountain scenery, alpine forests, and peaceful atmosphere, Dharwas is one of the most important and populated villages of the valley. Situated at high altitude, it remains cut off from the rest of the state for several months during winter due to heavy snowfall. The village is rich in natural springs, traditional wooden houses, and terraced fields where locals grow barley, peas, and potatoes. The people of Dharwas, primarily from tribal communities, preserve a unique culture expressed through their language, festivals, and traditional lifestyles. Because of its untouched beauty and serene environment, Dharwas is often described as one of the hidden gems of Himachal Pradesh.

10) GITABITAN

Gitabitan is the celebrated anthology of songs written by Rabindranath Tagore, the great Bengali poet, writer, and Nobel laureate. The title *Gitabitan* literally means

“Garden of Songs,” and the book brings together all of Tagore’s songs (Rabindra Sangeet)—a total of over 2,200 compositions—into one comprehensive collection. This compilation was first published in the early 1930s and later revised and organized by theme to make it easier for readers and musicians to navigate the works. The songs in *Gitabitan* cover a wide range of human experience and emotions, including devotion (puja), love (prem), nature (prakriti), patriotism (swadesh), occasion-specific pieces (aanushthanik), and dance-dramas or miscellaneous works (nrityonatyā and bichitro). Today, *Gitabitan* is regarded as a foundational resource for the study and performance of Rabindra Sangeet and remains deeply embedded in Bengali cultural and musical traditions.

QUESTION 1 (B)

Referring to the location and physical formation of karewas, highlight their

10 economic significance.

KAREWAS

Karewas are distinctive **lacustrine (lake-deposited) landforms** found mainly in the **Kashmir Valley and the Bhadarwah Valley** of the Jammu and Kashmir region, lying between the **Pir Panjal Range and the Great Himalayas**.

The term *Karewa* means “elevated tableland” in the Kashmiri language, and these features appear as **flat-topped terraces and mounds** composed of unconsolidated to semi-consolidated sediments such as sand, silt, clay, shale, mud, lignite and gravel.

They were formed during the **Pleistocene period** when rivers were blocked by tectonic uplift, creating a vast lake where sediments accumulated; later the lake drained, leaving behind these thick sediment deposits which were dissected and uplifted to form the present karewa landforms. Because of their **fertile, well-drained soils and favourable climate**, karewas have immense **economic importance**: they are the principal areas for **saffron cultivation**—especially around Pampore, giving Kashmir its world-famous *zafran* (which now has a GI tag)—and support extensive **horticulture**, including **apple orchards, almonds, walnuts**, and other cash crops.

These activities provide livelihoods for large rural populations and contribute significantly to the horticultural economy of the region. Karewas also hold

archaeological value due to fossils and ancient cultural deposits, adding scientific interest to their economic roles.

QUESTION 1(C)

How does the Himalayan ecosystem regulate the cropping pattern and agricultural activities in the Himalayan region of India?

The **Himalayan ecosystem**—comprising rugged terrain, steep slopes, varied altitudes, diverse climates, and fragile soils—plays a **decisive role** in shaping agricultural practices and cropping patterns across the region. The steep topography limits the availability of flat arable land, which forces farmers to adopt **terrace farming** to create small, level fields on mountain slopes; this helps reduce soil erosion and retain water, but also restricts the extent of cultivation and the type of machinery that can be used.

Altitude and climate are among the most critical natural regulators: as elevation increases, temperatures fall and the growing season shortens, which means that **lower Himalayan valleys support cereals like rice, wheat, and maize**, while **higher altitudes are suitable only for cold-tolerant crops** such as barley, buckwheat, millets, and some cool-season vegetables. This altitudinal zonation dictates what crops can mature successfully within the short summer months.

Climatic patterns—especially the monsoon—further influence cropping decisions. Since most Himalayan agriculture is **rain-fed**, the timing and amount of monsoon rainfall determine sowing and harvesting schedules; erratic rains or delayed monsoons often force farmers to adjust crops or switch to varieties that are more drought resilient.

Soil conditions in the Himalayas are generally shallow, nutrient-poor, and highly prone to erosion, which discourages wide cultivation of high-input, water-intensive crops. Traditional **mixed cropping systems** (like *Barahnaja* in Uttarakhand) and crop rotations have evolved to maintain soil fertility, reduce pest risks, and spread risk across seasons in this fragile agro-ecosystem.

Water availability from glacial melt and springs also shapes agriculture: in many areas, glacier-fed streams and springs provide limited irrigation that dictates crop choice and intensity; where water is scarcer, farmers grow drought-tolerant or short-duration crops.

The **ecosystem's influence on cropping patterns** is thus multifaceted—rooted in elevation, climate, soils, slope and water regimes—leading to **small, terraced farms, diversified cropping systems with cereals, millets, pulses and**

horticultural crops, and adaptation to short growing seasons and rainfall variability. These natural constraints have fostered resilient traditional farming systems that are uniquely adapted to Himalayan ecological conditions.

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1(d) Write a critically argued essay on nautical tourism and its infrastructure in India. ?

Nautical Tourism and Its Infrastructure in India

Nautical tourism refers to travel experiences based on voyages by sea, rivers, lakes, or other navigable waterways, including activities like cruising, sailing, yachting, water sports, marinas, and coastal leisure travel. It leverages a country's maritime and inland water resources to attract both domestic and international tourists. With a long coastline of over 7,500 km, more than 20,000 km of navigable inland waterways, around 1300 islands, and rich cultural and natural heritage, India possesses vast inherent potential for nautical tourism that could significantly contribute to its Blue Economy.

India's Current Infrastructure and Developments:

India has taken several steps to build foundational infrastructure. There are **12 major ports and about 200 minor/intermediate ports** that serve as the backbone of coastal access, and cruise terminals have been developed at places like **Ernakulam (Kochi) and Mumbai**, with further modernization underway to handle larger cruise liners. On inland waterways, enhanced navigational infrastructure and terminals on rivers such as the **Ganga and Brahmaputra** have supported the growth of river cruising, exemplified by historic journeys like the **MV Ganga Vilas** cruise, which spanned over **3,200 km** across multiple states.

Critical Gaps and Challenges:

Despite these initiatives, India's nautical tourism infrastructure remains underdeveloped compared to global standards. The existing major ports predominantly serve cargo and commercial shipping, leading to congestion and limited dedicated facilities for recreational vessels and luxury cruise liners. There is a lack of international-standard marinas for yachts and sailing boats, which restricts high-end nautical tourism and yacht charters—an area in which competitors like Dubai and Singapore have excelled.

2(A) Explain the factors which contribute to the growth of India's pharmaceutical Industry?

Here's a clear explanation of the factors that contribute to the growth of India's pharmaceutical industry:

1. **Cost-Effective Manufacturing:** India boasts low production costs due to cheaper labour, raw materials, utilities and economies of scale, making its medicines highly competitive in both domestic and global markets. This cost advantage helps India supply affordable generic medicines worldwide.
2. **Dominance in Generic Drugs:** The country is a global leader in generic drug production, supplying about 20 % of the world's generic medicines. This specialized expertise has been crucial in capturing export markets and driving industry expansion.
3. **Government Support and Policy Initiatives:** Policies like the Production Linked Incentive (PLI) scheme, Pradhan Mantri Bhartiya Janaushadhi Pariyojana (PMBJP) and other fiscal incentives have boosted domestic manufacturing, encouraged investment, and supported drug affordability and accessibility.
4. **Strong Export Growth:** India exports pharmaceutical products to over 200 countries, including major regulated markets like the USA and Europe. The expanding global footprint significantly contributes to growth in revenues and international market share.
5. **Foreign Direct Investment (FDI) and Collaborations:** Relaxed FDI norms allowing up to 100 % investment in greenfield pharma projects have attracted international capital. Partnerships with global firms support technology transfer, expanded product lines, and enhanced manufacturing capabilities.
6. **Rising Domestic Demand:** India's large and growing population, increasing healthcare awareness, rising incomes, and expanding health insurance coverage have boosted domestic demand for medicines and treatments.

7. Research & Development (R&D) Expansion: Investment in R&D, including development of new drug formulations, biosimilars, and advanced therapies, enhances innovation capacity and long-term industry growth.
pharma-dept.gov.i
8. Global Regulatory Compliance: Many Indian pharma plants meet stringent international quality standards (US FDA, WHO-GMP), facilitating access to lucrative export markets and building global trust in Indian products.
9. Robust API and Manufacturing Base: A strong base in Active Pharmaceutical Ingredients (APIs) and bulk drug production underpins India's manufacturing strength, reducing dependence on imports and supporting integrated drug production.
10. Demographic and Healthcare Trends: An aging population, rising incidence of chronic diseases (e.g., diabetes, cardiovascular conditions) and increased focus on preventive and specialised healthcare fuel sustained demand for pharmaceutical products.

2(B) Why are coral reefs in India most important with respect to its dynamic ecosystem ?

Coral reefs in India—found mainly in the Andaman & Nicobar Islands, Lakshadweep, Gulf of Mannar, Gulf of Kutch and parts of the east and west coasts—are among the most ancient and biologically dynamic marine ecosystems. They are often called the “rainforests of the sea” due to their richness in life and ecological functions.

1. Marine Biodiversity Hotspots

Coral reefs support an exceptionally high level of biodiversity. Although they cover a tiny fraction of the ocean floor, they harbour a quarter of all marine species, including fish, crustaceans, molluscs, turtles, and many rare organisms. They provide habitat, food, nursery and breeding grounds for these species, maintaining complex food webs and ecological balance.

2. Coastal Protection and Resilience

Reefs act as natural barriers that reduce the impact of strong waves, storms, tsunamis, storm surges, and coastal erosion. By dissipating wave energy, they protect shorelines, coastal settlements, infrastructure, mangroves, and seagrass beds, thereby enhancing coastal stability and resilience against climate change threats.

3. Fisheries and Food Security

Coral reef ecosystems are critical for fishery productivity. Many commercially important fish species depend on reefs for shelter and reproduction. This makes reefs indispensable for sustaining artisanal and commercial fisheries, which in turn support the livelihoods and food security of millions of coastal people

4. Economic and Livelihood Benefits

Reefs contribute significantly to coastal economies through:

- Fisheries that generate substantial income.
- Eco-tourism (snorkelling, scuba diving, reef tours) that attracts tourists and creates jobs in island and coastal regions.
These activities generate revenue and employment, especially in tourist hubs
- 5. Climate Regulation and Environmental Indicators
- Corals help in carbon sequestration by using dissolved CO₂ to build their calcium carbonate skeletons, thus playing a role in the ocean carbon cycle. Their sensitivity to changes in temperature, salinity, and acidity also makes them effective bio-indicators for assessing marine environmental health and early impacts of climate change
- Daman & Nicobar and Lakshadweep Islands

2(C) How does the agricultural sector of India confront with the contemporary physical and politico-economic changes in the different regions of the country ?

Elucidate.?

Introduction

Agriculture is a cornerstone of India's economy, providing employment to nearly **40% of the population** and contributing significantly to **GDP**. However, it faces dynamic challenges due to **climate change, population pressure, technological advancements, policy reforms, and market globalization**. These challenges differ across **regions** because of diverse **physical environments (soil, climate, water availability)** and **socio-economic conditions**.

2. Physical Changes and Agricultural Response

Physical changes mainly include **climatic variations, water availability, soil degradation, and extreme weather events.**

a) Northern Plains (Punjab, Haryana, Uttar Pradesh, Bihar)

- **Physical Context:** Fertile alluvial soil, high groundwater usage, intensive cropping.
- **Challenges:** Soil salinity, groundwater depletion, erratic monsoons.
- **Response:**
 - Adoption of **high-yielding varieties (HYV) of wheat and rice.**
 - Use of **drip irrigation and water-saving technologies.**
 - Crop diversification to **maize, pulses, and horticulture** in some areas to reduce risk.

b) Western India (Rajasthan, Gujarat)

- **Physical Context:** Arid/semi-arid regions, scarce rainfall, desertification risk.
- **Challenges:** Water scarcity, desertification, low soil fertility.
- **Response:**
 - **Rainwater harvesting** and construction of check dams.
 - Promotion of **drought-resistant crops** (millets, pulses).
 - Expansion of **livestock and dairy farming** as alternative income sources.

c) Eastern India (West Bengal, Odisha, Jharkhand)

- **Physical Context:** Heavy rainfall, deltaic areas, frequent floods and cyclones.
- **Challenges:** Flooding, soil erosion, salinity in coastal areas.
- **Response:**

- **Flood-tolerant rice varieties.**
- Elevated **polders and embankments** for coastal agriculture.
- Diversification into **aquaculture and fisheries.**

Politico-Economic Changes and Agricultural Response

Politico-economic changes include **government policies, liberalization, globalization, market integration, and social reforms.**

a) Policy Reforms

- **Green Revolution policies:** Enhanced food grain production in Punjab, Haryana, and western UP.
- **Subsidies and Minimum Support Prices (MSP):** Encourage cereal production but create regional disparities.

conclusion

- India's agricultural sector is **regionally adaptive**, responding to both **physical and politico-economic changes**. While northern and western India leverage technology and high-input farming, eastern and southern regions focus on **resilient and diversified strategies**. Policies, market reforms, and technological interventions are crucial in enabling **sustainable agriculture** across diverse agro-climatic zones.

Q3. Why is the pattern of population distribution of scheduled castes and scheduled tribes different in India? Compare their socio-economic problems with examples

India recognizes **Scheduled Castes (SCs)** and **Scheduled Tribes (STs)** as socially disadvantaged groups. While both face historical marginalization, their **population distribution patterns and socio-economic problems differ** due to historical, cultural, and geographical reasons.

- **SCs:** Traditionally “untouchables” in the caste hierarchy, mostly living in rural plains and integrated with the general population.
- **STs:** Indigenous tribes, often in **remote or forested areas**, with distinct cultures, languages, and ways of life.

Conclusion

- The **population distribution** differs mainly due to **historical occupation, social hierarchy, and geographical isolation**.
- SCs are concentrated in **fertile plains** and face mainly **social discrimination and economic marginalization**, but they have better access to urban opportunities.
- STs are concentrated in **forests and hilly areas**, face **economic deprivation and lack of infrastructure**, and are more isolated from mainstream development.
- Both groups require **targeted policies** to address **education, employment, and social integration**, keeping in mind their unique regional contexts.

3(b) Highlight the characteristics of land utilisation in the Eastern Ghats region of India. What are the recent threats to land utilisation methods in the region ?

The **Eastern Ghats** are a discontinuous range of hills running along the eastern coast of India, primarily through **Odisha, Andhra Pradesh, Telangana, Tamil Nadu, and Karnataka**. The region has **undulating terrain, poor soil fertility, and a tropical climate**. These factors influence **land utilization patterns**, making them distinct from the fertile plains of eastern India.

Recent Threats to Land Utilization Methods

1. Deforestation

- Cause: Expansion of agriculture, timber extraction, and mining.
- Effect: Loss of forest cover, soil erosion, reduced water retention.

2. Mining Activities

- Cause: Rich mineral deposits (iron, bauxite, manganese) are extensively mined.
- Effect: Large-scale land degradation, loss of fertile soil, contamination of water bodies.

3. Urbanization and Industrialization

- Cause: Growing towns and industrial hubs in Andhra Pradesh, Odisha, and Tamil Nadu.
- Effect: Conversion of agricultural or forest land to built-up areas, fragmentation of farming land.

4. Soil Erosion and Degradation

- Cause: Heavy monsoon rains on steep slopes and unsustainable farming practices.
- Effect: Reduced agricultural productivity, landslides in hilly areas.

5. Climate Change

- Cause: Erratic rainfall, droughts, and increased frequency of cyclones.
- Effect: Uncertainty in rainfed agriculture, decline in crop yields.

6. Shifting Cultivation (Jhum)

- Cause: Traditional tribal practice in some areas.
- Effect: When intensified or repeated without fallow periods, leads to deforestation and land degradation.

4. Conclusion

The Eastern Ghats region has a diverse but fragile land use pattern, dominated by forests, rainfed agriculture, and mining. Recent threats like deforestation, mining, urbanization, soil erosion, and climate change are altering traditional land utilization patterns, calling for sustainable land management practices such as afforestation, soil conservation, regulated mining, and watershed development.

3(C) What are the challenges of the dairy sector in India ? Describe the contribution of the bovine population.

1. Low Productivity of Animals

- Average milk yield per animal is significantly lower than global standards.
- Poor genetics, limited access to high-quality breeding services, and inadequate scientific management reduce output.

2. Feed and Fodder Shortage

- India faces a **chronic deficit** of green fodder, dry fodder, and concentrate feed.
- Rising costs of feed reduce farmers' profitability.

3. Veterinary and Extension Gaps

- Shortage of trained veterinary professionals and para-vets.
- Limited access to preventive healthcare (vaccination, deworming) and timely treatment.

4. Fragmented Supply Chain

- Many small and marginal farmers are unorganized.
- Inefficiencies in milk procurement, chilling, and transportation lead to quality deterioration.

5. Poor Infrastructure

- Inadequate number of bulk milk coolers, chilling centers, and quality testing facilities.
- Cold-chain gaps lead to spoilage and wastage.

6. Dominance of Unorganized Sector

- Nearly **70% of milk is handled by unorganized players** (milk vendors, contractors).
- Leads to inconsistent pricing, poor quality control, and lack of value addition.

7. Market Volatility and Price Fluctuations

- Absence of stable pricing mechanisms.
- Farmers face low bargaining power and volatile returns.

8. Disease Burden

- FMD, Brucellosis, mastitis, and other diseases reduce productivity.
- Limited penetration of national disease-control programs.

9. Climate Change Stress

- Heat stress reduces fertility and milk yield.
- Water scarcity and irregular rainfall affect fodder production.

10. Lack of Technology Adoption

- Slow adoption of milking machines, sensors, AI-based monitoring, and cattle wearables.
- Limited digital literacy among small farmers.

Contribution of Bovine Population to the Dairy Sector

India's dairy sector is deeply linked to its large bovine population.

1. India Has the World's Largest Bovine Population

- Includes **cattle, buffaloes, and cross-breeds**.
- This extensive base is the main reason India leads the world in milk production.

2. Buffaloes Contribute Significantly to Milk Output

- Buffalo milk accounts for **more than 45% of total milk production** in India.
- Indian breeds like Murrah and Jaffarabadi are globally known for high fat content.

3. Indigenous Cattle Provide Resilience

- Native breeds (Gir, Sahiwal, Rathi, Tharparkar) offer:
 - Higher disease resistance
 - Better heat tolerance
 - Lower maintenance costs

4. Crossbred Cattle Enhance Productivity

- Crossbreeding with high-yielding exotic breeds (HF, Jersey) improves milk yield.
- Significant contributor to urban and peri-urban dairying.

5. Source of Draft Power and Organic Manure

- Bovine population contributes to:
 - **Biogas generation**
 - **Natural fertilizers**, lowering reliance on chemical inputs
 - **Draft power** for small farmers

6. Employment and Rural Livelihoods

- Livestock contributes nearly **one-fourth of agricultural GDP**.
- Over **70 million rural households** depend on dairying—largely due to the widespread distribution of bovines.

Conclusion

India's dairy sector has immense potential due to its large and diverse bovine population, which forms the backbone of milk production, rural livelihoods, and nutritional security. However, challenges such as low productivity, feed shortages, infrastructure gaps, and weak organization need urgent attention to unlock the sector's full potential and ensure sustainable growth.

4(a) "Socio-political landscape in India is a result of regional consciousness creating inter-state disputes." Discuss with region specific examples.

India's socio-political fabric is shaped by a complex interplay between regional identity, sub-national aspirations, and federal political structures. While regional consciousness often strengthens cultural diversity and fosters development-oriented politics, it can also produce **inter-state disputes**, influencing the socio-political landscape.

1. Linguistic Regionalism and State Reorganisation

The formation of linguistic states strengthened regional identities but also intensified border claims.

Examples

- **Maharashtra vs Karnataka (Belagavi/Karnataka–Maharashtra Border Dispute):**
Marathi-speaking population in Belagavi fuels Maharashtra's claim, while Kannada identity drives Karnataka's resistance.

- **Assam vs Nagaland/Arunachal Pradesh/Meghalaya:**
Ethno-linguistic identities and historical territorial claims have led to recurrent border clashes.

Impact on socio-politics:

Electoral mobilization around identity, politicization of language issues, regional party dominance.

2. Resource-based Regional Consciousness Leading to Water Disputes

Rivers crossing multiple states generate competition, shaped by regional development priorities and cultural associations.

Examples

- **Cauvery Dispute (Karnataka–Tamil Nadu):**
Farmer identity and agrarian dependence have created strong emotional and political mobilization.
- **Krishna River Dispute (Maharashtra–Karnataka–Telangana–AP):**
Each state frames access to water as essential to regional prosperity.
- **Satluj–Yamuna Link (SYL) Canal Issue (Punjab–Haryana):**
Punjab's agricultural identity and historic grievances shape resistance to sharing river waters.

Impact:

Bandhs, protests, litigation, competitive regional politics, and Centre–state friction.

3. Ethno-Cultural Aspirations and Autonomy Movements

Distinct cultural identity often translates into demands for autonomy or statehood, triggering disputes with neighbouring regions.

Examples

- **Gorkhaland Movement (Darjeeling, WB):**
Nepali-speaking population's demand for statehood creates tension with West Bengal; affects regional electoral politics.

- **Bodoland, Karbi Anglong, and other tribal movements (Assam):**
Overlapping ethnic homelands create friction between communities and adjacent districts/states.
- **Telangana Movement (AP):**
Regional resentment over perceived neglect led to bifurcation, illustrating strong sub-regional consciousness.

4. Migration-Driven Identity Assertion

Intra-state and inter-state migration often leads to "sons of the soil" politics.

Examples

- **Mumbai (Maharashtra):**
Regional parties employ Marathi asmita (pride) to challenge migrants from UP/Bihar.
- **North-East States:**
Anti-immigrant sentiment (Assam, Meghalaya, Tripura) affects inter-state relations and Centre-state dynamics.

Impact:

Communal tensions, regional party rise, and demand for protective legislation (ILP, NRC).

5. Economic Regionalism and Developmental Imbalances

Perceived discrimination by the Centre or neighbouring states fuels competitive regionalism.

Examples

- **Special Category Status demand (Bihar, Odisha, Andhra Pradesh):**
Linked to development identity and resource allocation.
- **Industrial corridor disputes (e.g., Mumbai-Ahmedabad region, Chennai-Bengaluru corridor):**
Competition for investment shapes political narratives.

6. Historical and Cultural Regional Identity

Historical claims tied to cultural memory also shape disputes.

Examples

- **Hyderabad-Karnataka vs Marathwada political contestations** over cultural heritage.
- **Kashmir's special identity (pre-2019 Article 370)** influenced Centre-state and inter-regional political alignments.

Conclusion

Regional consciousness is not inherently destabilizing; it reflects India's rich diversity and empowers local identities. However, when regional pride intersects with competition for territory, resources, and political power, inter-state disputes intensify. These disputes shape electoral politics, party systems, Centre-state relations, and policy priorities—defining the unique socio-political landscape of contemporary India.

4(b) Why cottage industries in India are an integral part of Indian socio-economic structure ? Assess this with reference to different types of cottage industries in rural India?

Why cottage industries are integral to India's socio-economic structure

Cottage industries—small-scale, labour-intensive units using local skills and resources—form the backbone of rural India. They are integral to India's socio-economic structure for several reasons.

1. Employment and Livelihood Security

They provide **non-farm employment** to millions, especially women, artisans, and landless labourers. In areas with disguised unemployment in agriculture, cottage industries absorb surplus labour and reduce rural distress.

2. Preservation of Cultural Heritage

Many cottage industries are rooted in traditional craftsmanship—handloom, pottery, and metalwork—which preserve India's cultural continuity and artisanal identity.

3. Local Resource Utilisation and Low Capital Needs

They thrive on local raw materials like cotton, jute, bamboo, clay, and silk, enabling production even in resource-poor regions with minimal capital.

4. Contribution to Rural Economy and Exports

They support rural incomes, encourage local entrepreneurship, and contribute significantly to exports—handicrafts, carpets, coir, and handloom have global markets.

5. Women's Empowerment and Social Inclusion

Cottage industries allow home-based work, empowering women and marginalized communities, promoting inclusive growth.

Assessment with Reference to Types of Cottage Industries

1. Handloom Industry

- Provides employment to millions, second only to agriculture.
- Preserves diverse weaving traditions (Banarasi, Kanchipuram, Sambalpuri).

2. Handicrafts

- Woodwork (Saharanpur), stone craft (Rajasthan), metal craft (Moradabad), pottery etc.
- Promote cultural tourism and export earnings.

3. Khadi and Village Industries

- Khadi spinning and weaving sustain Gandhian rural self-reliance philosophy.
- Support rural household incomes in drought-prone regions.

4. Coir, Jute, and Bamboo Crafts

- Leverage abundant natural fibres in coastal and northeastern India.
- Provide eco-friendly livelihood options.

Conclusion

Cottage industries are thus not just economic units but carriers of tradition, resilience, and inclusive development—deeply embedded in India's socio-economic fabric.

4(C) The rural settlements in India are highly diversified due to both physical and cultural factors." Justify the statement with examples.

Rural settlements in India exhibit enormous diversity in their **form, pattern, size, and spacing**, shaped jointly by **physical (natural)** and **cultural (human)** factors.

1. Physical Factors

a) Relief

- **Mountain and Himalayan regions** (Himachal, Uttarakhand, NE states) have **dispersed, hamleted settlements** due to steep slopes.
- **Indo-Gangetic plains** support **compact and large nucleated villages** because of flat topography.

b) Climate

- **Rajasthan's arid regions** show **scattered settlements** around oases and water sources.
- **Humid coastal regions** (Kerala, Konkan) show **linear settlements** along roads and rivers.

c) Soil and Water Availability

- Fertile **alluvial soil** of Punjab, Haryana → large compact villages.
- **Black soil regions** (Deccan plateau) → dispersed farmsteads due to large field holdings.

2. Cultural Factors

a) Social Structure

- **Jajmani and caste-based villages** in Uttar Pradesh and Bihar form **compact, segregated hamlets** (e.g., *tolas, pallis*).

b) Ethnic Traditions

- **Tribal settlements** in Jharkhand, Odisha, and NE India have **clustered, clan-based villages**.
- **Nagaland's hilltop settlements** reflect security traditions.

c) Agricultural Practices

- **Wet-rice cultivation** in Assam and Bengal encourages **dense, compact villages**, while **pastoralism** in Gujarat and Rajasthan results in **dispersed dwellings** like *dhanis* and *wandas*.

Conclusion

Thus, India's rural settlements are a mosaic shaped by the interaction of nature and culture, producing distinctive regional patterns across the country.

5(A) How can rural-urban fringe be delineated? Explain with suitable examples from India.

The rural settlements in India are highly diversified due to both physical and cultural factors.” – Justification

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Thus, India's rural settlements are a mosaic shaped by the interaction of nature and culture, producing distinctive regional patterns across the country.

5(a) How can the rural–urban fringe be delineated? Explain with examples from India?

The **rural–urban fringe** is a transitional zone where urban expansion meets rural land uses. It can be delineated using **spatial, functional, socio-economic and ecological indicators** that reveal gradual shifts from rural to urban characteristics.

1. Land-Use Indicators

- Increasing proportion of **built-up area**, real estate projects, warehouses, transport terminals.
 - Reduction of agricultural land and rise of **mixed land uses**.
Example: Delhi's outer areas such as **Najafgarh, Narela, Bawana** show farmhouses, resettlement colonies, and industrial sheds marking the fringe.
-

2. Population and Demographic Indicators

- Rising population density, influx of migrants, occupational shift from agriculture to services.
Example: Rajarhat (Kolkata) transformed from agrarian villages into peri-urban residential–IT corridor zones.
-

3. Economic and Occupational Structure

- Sharp decline in agricultural workforce and increase in non-farm activities: transport, retail, construction.

Example: Gachibowli–Serilingampally (Hyderabad): shift from paddy growers to IT and service workers.

4. Physical and Infrastructure Indicators

- Expansion of **roads, metro lines, sewerage, electricity**, but incomplete or uneven.

Example: Bengaluru’s Outer Ring Road belt—Horamavu, Marathahalli—shows mixed rural–urban services.

5. Administrative and Planning Boundaries

- Fringe often lies outside municipal limits but influenced by city planning activities.

Example: Pune–PCMC periphery (Hinjewadi, Bavdhan) governed by gram panchayats but functionally urban.

Conclusion

Delineating the rural–urban fringe requires a combination of **land-use, demographic, economic, infrastructural, and administrative criteria**, which together reveal India’s dynamic peri-urban transformations.

5(b) "Spatial distribution of religious groups in India does not show any specific

pattern." Illustrate with arguments.

India’s religious geography is **highly diverse, regionally varied, and historically shaped**, making it impossible to identify one single spatial pattern. Instead of uniformity, India exhibits **multiple overlapping patterns** resulting from history, migration, political boundaries, and socio-cultural factors.

1. Hindus: Widespread but not uniformly distributed

- Hindus form the majority in most Indian states, yet **their proportion varies greatly**.
- They dominate in **North, West, Central, and South India**, but are minorities in:

- **Jammu & Kashmir**
 - **Punjab**
 - **Nagaland, Mizoram, Meghalaya**
- Thus, although widespread, their distribution **is not evenly dispersed**.
-

2. Muslims: Concentrated pockets, not one region

Muslims are the **largest minority**, but their distribution forms **several distinct clusters** rather than a single region:

- **Kashmir Valley**
- **Uttar Pradesh (major concentrations in Rohilkhand & Doab)**
- **West Bengal**
- **Kerala (Malabar region)**
- **Assam and parts of Bihar**

These dispersed concentrations show **no simple north-south or east-west pattern**, but reflect **historical settlements, trade routes, and political influences**.

3. Christians: Strong in the far Northeast and Kerala

Christians show a **bimodal distribution**:

- Very high concentration in **Nagaland, Mizoram, Meghalaya** (tribal conversions).
- Substantial presence in **Kerala**, linked to early Christian traditions and missionary activity.

This creates a **dual-pattern distribution**, not tied to continuous geographic zones.

4. Sikhs: Highly concentrated in one state

Sikhs show an **extreme regional concentration**, with **Punjab** having over half of India's Sikh population.

- Neighboring areas like **Haryana and Delhi** have moderate populations.
- Beyond this, Sikhs are scattered in small pockets.

This **localized concentration** breaks any idea of a uniform national pattern.

5. Buddhists: Mostly in Maharashtra, not Himalayan belt alone

Although traditionally linked with Himalayan regions (Ladakh, Himachal Pradesh), the **largest Buddhist population** is in **Maharashtra** due to Neo-Buddhist (Dalit) movements.

- This **social reform–driven cluster** does not align with traditional geographic expectations.
-

6. Jains and Parsis: Urban and economic–driven distributions

- **Jains** are concentrated in **Rajasthan, Gujarat, Maharashtra, and Karnataka**—largely due to trade routes and mercantile communities.
- **Parsis** are highly concentrated in **Mumbai** due to colonial-era migration and economic opportunities.

This reflects **urban–commercial patterns**, not geographic or climatic ones.

7. Tribal religions: Scattered pockets

Tribal communities practicing indigenous faiths live in:

- **Central India (Jharkhand, Chhattisgarh, Odisha)**
- **Northeast**
- **Andaman & Nicobar Islands**

Their distribution follows **tribal settlement areas**, not a uniform pattern.

Why no single pattern emerges?

Because India's religious geography is shaped by:

1. **Historical invasions and kingdoms**
2. **Migration (internal and external)**
3. **Colonial missionary activities**
4. **Trade routes and economic opportunities**
5. **Cultural assimilation and tribal isolation**
6. **Regional political histories**

Each religious group followed **different historical trajectories**, producing **complex, overlapping, and region-specific patterns**.

Conclusion

India's religious distribution does not follow any **single identifiable pattern** such as north-south, coastal-inland, or rural-urban. Instead, it is shaped by **multiple, distinct and region-specific factors**, resulting in a **highly diverse and mosaic-like religious geography**.

**5(c) "Watershed is the most appropriate spatial unit for planning."
Comment**

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A watershed is a natural hydrological unit draining water to a common point. It is increasingly considered the most appropriate spatial unit for planning because it aligns with natural processes rather than administrative boundaries.

Why watershed is an appropriate planning unit

1. Natural, holistic boundary
A watershed encompasses land, water, vegetation, and human activities within a single ecological system. Planning within such natural boundaries ensures integrated resource management.
2. Efficient water resource management
It allows coordinated planning for soil moisture, groundwater recharge, irrigation, and rainwater harvesting, which cannot be effectively addressed within arbitrary administrative boundaries.
3. Soil and land degradation control
Watersheds help manage soil erosion, sedimentation, deforestation, and land degradation because interventions (e.g., check dams, contour bunding) act along natural slopes and drainage lines.
4. Sustainable agricultural productivity
By managing land according to slope, soil type, and water flow, watershed-based planning helps optimize cropping patterns, water use efficiency, and livelihood resilience, especially in rainfed areas.
5. Community participation
Watershed boundaries often align with local resource-use patterns, enabling community-based natural resource management (e.g., joint forest management, participatory irrigation management).
6. Reduces inter-sectoral conflicts
Since planning is done within a single hydrological system, it minimizes conflicts between upstream and downstream users, and balances environmental, economic, and social objectives.

Limitations / Caveats

- Administrative boundaries (villages, blocks) rarely match watershed boundaries, creating issues in governance and coordination.
- Requires strong institutional mechanisms and technical capacity.
- Upstream–downstream disparities can create equity challenges if benefits are unevenly distributed.

Conclusion

Despite some administrative challenges, the watershed remains the most scientifically grounded and ecologically sound spatial unit for planning in India. It ensures integrated, sustainable, and participatory management of land and water resources, especially crucial in rainfed and drought-prone regions.

6(a) Describe the causes of the phenomenon of 'urban heat island'. What are the effective measures to deal with this phenomenon in India?

6(a) Describe the causes of the phenomenon of 'urban heat island'. What are the effective measures to deal with this phenomenon in India? write in paragraph

Urban Heat Island (UHI) refers to the phenomenon in which urban areas experience higher temperatures than their surrounding rural areas. The main causes of UHI include rapid urbanisation and the replacement of natural surfaces such as soil, vegetation, and water bodies with concrete, asphalt, and buildings, which absorb and retain more heat. The reduction of green cover decreases evapotranspiration, a natural cooling process. High-rise buildings and narrow streets trap heat and restrict air circulation, while increased energy consumption from vehicles, air conditioners, industries, and generators releases large amounts of waste heat. Air pollution also contributes by trapping heat in the lower atmosphere.

Effective measures to deal with Urban Heat Island in India include increasing urban green spaces through parks, green belts, urban forests, and rooftop gardens. Promoting cool roofs, reflective building materials, and permeable pavements can reduce heat absorption. Sustainable urban planning with proper ventilation corridors, protection of water bodies, and reduced vehicular emissions is essential. Public transport, renewable energy use, and climate-sensitive building designs adapted to local conditions can significantly mitigate the UHI effect in Indian cities.

6(B) With reference to the transport and communication network of India, critically discuss the Sagarmala project.

The Sagarmala Project is a flagship initiative of the Government of India aimed at promoting port-led development by strengthening the country's transport and communication network, especially along the coastline. It focuses on modernising ports, improving port connectivity through rail, road, inland waterways, and coastal shipping, and developing coastal economic zones to reduce logistics costs and boost trade. The project seeks to integrate ports with industrial clusters, smart cities, and global supply chains, thereby enhancing India's maritime competitiveness. However, despite its potential, the Sagarmala project faces several challenges. Delays in project execution, inadequate last-mile connectivity, environmental concerns related to coastal ecosystems and displacement of fishing communities, and coordination issues between central and state governments have limited its effectiveness. Additionally, over-emphasis on port infrastructure without corresponding improvements in hinterland connectivity and digital communication networks can reduce its overall impact. Therefore, while Sagarmala has the potential to transform India's transport and communication network, its success depends on sustainable planning, inclusive development, and effective implementation.

6(c) What are the key features of sex-ratio of population in India ? Evaluate the impacts of child sex-ratio on general sex-ratio in the country.

The sex ratio of population in India shows a persistent imbalance, reflecting deep-rooted socio-cultural and economic factors. India's overall sex ratio has historically been unfavourable to females, though recent decades have shown a gradual improvement. There are wide regional variations, with states like Kerala and Chhattisgarh recording higher sex ratios, while Haryana, Punjab, and Uttar Pradesh show lower values. The sex ratio also varies between rural and urban areas, with rural areas generally having a better female ratio. Age-wise patterns reveal a sharper decline in younger age groups, indicating gender discrimination at birth and early childhood.

The child sex ratio (0–6 years) has a significant impact on the general sex ratio of the country. A low child sex ratio, caused mainly by sex-selective abortions, female infanticide, and neglect of girl children, leads to fewer females entering the reproductive age group in the future, thereby worsening the overall sex ratio. Over time, this imbalance results in demographic distortions such as increased male dominance, difficulties in marriage patterns, and social issues like trafficking and crime against women. Therefore, improving the child sex ratio through legal

enforcement, education, and social awareness is crucial for achieving a balanced sex ratio in India.

7(A) Explain the factors that contribute to droughts in India with specific reference to food production, distribution and availability. Can Indian agricultural policies resolve the issue?

Droughts in India are caused by a combination of natural and human-induced factors and have a direct impact on food production, distribution, and availability. Erratic and uneven monsoon rainfall, delayed onset or early withdrawal of the monsoon, and increasing frequency of extreme climatic events reduce soil moisture and crop yields, particularly in rain-fed regions. Overdependence on monsoon-based agriculture, low irrigation coverage in many areas, and excessive extraction of groundwater further intensify drought conditions. Decline in agricultural productivity affects food production, leading to reduced market supply, price rise, and regional shortages.

Weak storage, transport, and public distribution systems worsen food availability, especially for vulnerable populations. While Indian agricultural policies such as crop insurance, minimum support prices, irrigation schemes, and the Public Distribution System aim to mitigate drought impacts, their effectiveness is uneven due to implementation gaps, regional disparities, and policy bias toward water-intensive crops. Therefore, although agricultural policies can partially address drought-related food insecurity, long-term resolution requires climate-resilient farming, crop diversification, efficient water management, and institutional reforms.

7(B) What are the causes and consequences of land degradation due to desertification in India? Examine with reference to various regional issues.

Land degradation due to desertification in India is caused by a combination of climatic and human factors and varies across regions. Low and erratic rainfall, recurrent droughts, and high evapotranspiration contribute to natural aridity, especially in western India. Human activities such as deforestation, overgrazing, expansion of agriculture into marginal lands, excessive irrigation leading to salinisation, mining, and unscientific land use practices accelerate land degradation. Regions like Rajasthan and Gujarat face wind erosion and sand dune expansion, while Punjab and Haryana experience soil salinity and waterlogging due to intensive irrigation. In Deccan Plateau areas such as Maharashtra and Telangana,

drought-prone conditions combined with monocropping worsen land degradation, whereas in eastern India, mining and deforestation degrade fertile land. The consequences include loss of soil fertility, declining agricultural productivity, food insecurity, rural poverty, and forced migration, along with ecological impacts such as biodiversity loss and increased frequency of dust storms. Thus, desertification poses serious regional and national challenges, requiring sustainable land management and region-specific interventions

7(C) Examine the validity of Blue Economy initiatives of India. Elaborate the impacts of this economy on the country's development.

The Blue Economy initiatives of India aim to promote sustainable use of ocean and coastal resources for economic growth, livelihood generation, and environmental conservation, and are increasingly relevant given India's long coastline and vast Exclusive Economic Zone. Initiatives such as Sagarmala, Deep Ocean Mission, coastal fisheries development, marine renewable energy, and port-led industrialisation demonstrate the economic validity of the Blue Economy by enhancing trade, logistics efficiency, employment, and maritime security. These initiatives contribute to national development by boosting GDP, improving connectivity, supporting coastal communities, and strengthening India's role in the global maritime economy. However, the validity of these initiatives depends on their sustainability and inclusiveness. Environmental concerns such as marine pollution, coastal erosion, overfishing, and displacement of traditional fishing communities raise questions about long-term viability. While the Blue Economy has the potential to accelerate economic growth, regional development, and technological advancement, its success requires integrated coastal zone management, strong regulatory frameworks, and community participation. Therefore, India's Blue Economy initiatives are developmentally significant but must balance economic ambitions with ecological sustainability and social equity.

8(A) While defining green architecture, discuss its principles and challenges in response to climate change in India.

Green architecture refers to the design and construction of buildings that minimise environmental impact while enhancing energy efficiency, resource conservation, and occupant well-being. Its core principles include climate-responsive design, use of renewable energy, energy-efficient lighting and ventilation, water conservation through rainwater harvesting and recycling, use of local and sustainable building materials, and reduction of waste and carbon emissions. In the context of climate change in India, green architecture can reduce urban heat stress, lower energy demand, and enhance resilience to extreme weather events. However, its widespread adoption faces several challenges such as higher initial costs, lack of awareness and skilled professionals, limited enforcement of building codes, and regional climatic diversity that demands customised designs. Additionally, rapid urbanisation, informal housing growth, and weak institutional support hinder large-scale implementation. Thus, while green architecture is a crucial climate-responsive solution for India, overcoming financial, technical, and policy barriers is essential for its effective contribution to sustainable development.

8(B) With reference to typical examples, assess why regional planning in India is important for island territories for their sustainable development.

Regional planning is crucial for the sustainable development of India's island territories due to their ecological fragility, limited resource base, and strategic significance. Islands such as the Andaman and Nicobar and Lakshadweep face constraints of land scarcity, freshwater availability, fragile coral ecosystems, and high vulnerability to climate change, sea-level rise, and cyclones. Unplanned tourism, infrastructure expansion, and population pressure can easily lead to environmental degradation, coastal erosion, and loss of biodiversity, as seen in coral bleaching in Lakshadweep and forest degradation in the Andaman Islands. Regional planning helps balance development and conservation by promoting eco-tourism, disaster-resilient infrastructure, renewable energy use, sustainable fisheries, and controlled urban growth. It also improves connectivity, healthcare, and livelihood opportunities while respecting local communities and indigenous populations. Therefore, region-specific planning is essential to ensure that development in India's island territories remains economically viable, socially inclusive, and environmentally sustainable.

8(c) With reference to international boundaries of India, discuss the related issues, giving suitable examples.

India shares its international boundaries with seven countries: Pakistan, China, Nepal, Bhutan, Bangladesh, Myanmar, and Afghanistan (via the Wakhan Corridor). These boundaries give rise to several geopolitical, security, and socio-economic issues. With Pakistan, disputes over Kashmir and cross-border terrorism have led to frequent military tensions. The India-China boundary, especially along the Line of Actual Control in Ladakh and Arunachal Pradesh, has witnessed conflicts, such as the 1962 war and recent skirmishes in 2020. Porous borders with Nepal, Bhutan, and Bangladesh create challenges of illegal migration, smuggling, and cross-border crime. The India-Myanmar border faces issues of insurgency and drug trafficking. Additionally, undefined or disputed border segments, difficult terrain, and inadequate infrastructure hinder effective border management. These issues underscore the need for diplomatic engagement, robust security measures, cross-border cooperation, and development of border infrastructure to maintain peace and stability while facilitating trade and connectivity.