

MASTERING MAPPING

— BY ASKDEPOT —

*The Conceptual Architecture of World & India Mapping
— for Civil Services —*

INDIA'S FIRST STRUCTURED CONCEPTUAL
MAPPING ARCHITECTURE FOR UPSC

— Think in Maps. Write with Precision. —

For UPSC CSE • IFoS • State PCS

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Mastering Mapping

by AskDepot

HOW TO LOOK DEEP INTO A MAP FOR UPSC

(India's first Conceptual Mapping Framework – AskDepot Architecture)

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Chapter 2

Africa

Africa is not merely a continent of countries; it is a continent where **geography acts as destiny**. For a serious mapping study, Africa must be approached not as a list of names to be memorised, but as a **spatial system in which latitude, relief, climate, resources, and geopolitics are organically linked**. This is precisely why Africa occupies a disproportionately high importance in UPSC Prelims, Mains, and even Essay papers.

Africa's uniqueness begins with its **latitudinal symmetry**. The Equator almost bisects the continent, while the Tropic of Cancer and the Tropic of Capricorn pass through its northern and southern parts respectively. This creates a near-ideal laboratory of global climatic zones—from equatorial rainforests to tropical Savannah,

subtropical deserts, and Mediterranean margins. Consequently, mapping Africa without a latitude-based framework leads to conceptual errors in climate, vegetation, and river systems.

Physiographically, Africa is best understood as a **plateau continent**, not a mountain-dominated one. Its relief structure explains why rivers such as the Nile, Congo, Niger, and Zambezi show long courses with abrupt waterfalls and rapids near the coast, and why large natural lakes are concentrated along the East African Rift System. Thus, physical mapping becomes the backbone for understanding hydrology, ecology, and human settlement patterns.



From a geopolitical perspective, Africa's map explains its history of colonial boundaries, ethnic fragmentation, resource-driven conflicts, and strategic maritime importance. The Mediterranean Sea, Red Sea, Gulf of Guinea, and the Indian Ocean are not merely water bodies but **active geopolitical theatres** connecting Africa to Europe, West Asia, and the Indo-Pacific. Modern issues such as piracy in the Horn of Africa, mineral geopolitics of the Congo Basin, and India-Africa relations cannot be understood without precise spatial awareness.

Therefore, Africa mapping must follow a **conceptual hierarchy**: boundaries → latitude → physiography → climate → rivers → resources → political regions. Such a map-first, logic-driven approach not only strengthens factual recall but also equips an aspirant to solve elimination-based MCQs, enrich Mains answers, and

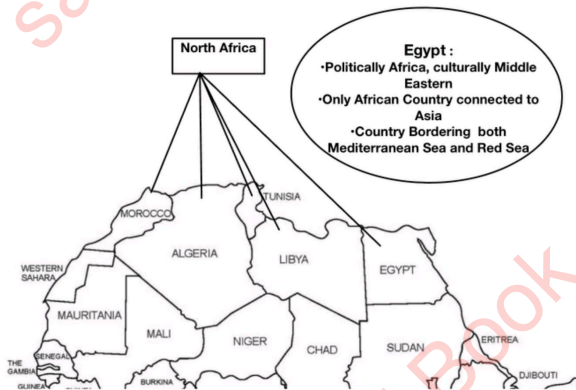
The 5 Political Regions of Africa

1. North Africa
2. West Africa
3. Central Africa
4. East Africa
5. Southern Africa

This regional lens is the key to speed + accuracy.

1-North Africa (Mediterranean + Arab World)

Countries lie **north of Sahara**, culturally closer to West Asia.



Must-know countries (west → east):

- Morocco
- Algeria
- Tunisia
- Libya
- Egypt

UPSC Hook:

- Egypt is Only African country connected to Asia (Sinai).
- “Country bordering both Mediterranean Sea and Red Sea” → Egypt

2-West Africa (Gulf of Guinea Cluster)

Core states often asked:

- Nigeria (most populous)
- Ghana
- Senegal
- Mali
- Niger
- Burkina Faso
- Ivory Coast (Côte d’Ivoire)
- Guinea
- Sierra Leone

3-Central Africa (Equatorial & Landlocked Core)

Think **rainforest + landlocked + political instability**.

Core Countries of Central Africa

1. Cameroon
2. Central African Republic



- Liberia
- Benin
- Togo
- Gambia
- Cape Verde (island state)

Trick: Nigeria + Niger are **different** (river name confusion).

Coastal sequence: Senegal → Gambia (inside Senegal!) → Guinea → Sierra Leone → Liberia → Ivory Coast → Ghana → Togo → Benin → **Nigeria**

Nigeria = anchor country



- Largest population
- Oil exporter
- Gulf of Guinea

3. Chad
4. Republic of the Congo (Congo-Brazzaville)
5. Democratic Republic of the Congo (DR Congo / Congo-Kinshasa)
6. Equatorial Guinea
7. Gabon

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8. **São Tomé and Príncipe** (*Island state in Gulf of Guinea*)

Exam-Relevant Notes (Very Important)

- **DR Congo** is the **largest** and most resource-rich country in Central Africa.
- **Chad** acts as a **transition state** (links North Africa–Sahel–Central Africa).
- **Cameroon** is called “**Africa in Miniature**” (diverse climate & relief).
- **São Tomé and Príncipe** is often **missed** because it is an **island country**.

UPSC Hook:

- **Congo vs DRC**
 - DRC → bigger, mineral rich, unstable
 - Congo → smaller, west of DRC

4-East Africa (Rift Valley + Horn of Africa)

Most geopolitically active region.

Core Countries of East Africa

1. **Ethiopia** (*landlocked*)
2. **Eritrea**
3. **Djibouti**
4. **Somalia**
5. **Kenya**
6. **Uganda**
7. **Tanzania**
8. **Rwanda**
9. **Burundi**
10. **South Sudan**
11. **Sudan** (*often grouped with East/North-East Africa*)
12. **Madagascar** (*island state, UPSC-relevant*)
13. **Comoros** (*often asked*)
14. **Seychelles** (*Indian Ocean*)
15. **Mauritius** (*Indian Ocean*)

Sub-Regional Logic (Very Important for Prelims)

Horn of Africa



- Ethiopia, Eritrea, Djibouti, Somalia
- *Geostrategic hotspot (Red Sea–Bab el-Mandeb)*

Great Lakes Region

- Uganda, Kenya, Tanzania, Rwanda, Burundi
- *Rift Valley lakes, population density, conflicts*

Island East Africa

- Madagascar, Comoros, Seychelles, Mauritius
- *Ocean currents, cyclones, biodiversity*

Ethiopia (Ethiopia facts)

- Landlocked
- Never colonised



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- Source region of Blue Nile

UPSC Hook: “Landlocked country in Horn of Africa” → Ethiopia

Physical Geography Anchors

- **Great Rift Valley**
- Major lakes: Victoria, Tanganyika, Malawi
- High plateaus & volcanoes (Ethiopian Highlands, Mt. Kilimanjaro)

5- Southern Africa (Minerals + Apartheid Legacy)

Relatively easier & stable cluster.

Core Southern Africa Countries

1. South Africa
2. Namibia
3. Botswana
4. Zimbabwe
5. Zambia
6. Mozambique
7. Angola
8. Malawi
9. Lesotho (*landlocked within South Africa*)
10. Eswatini (*formerly Swaziland*)

Exam-Relevant Notes

- **South Africa** is the **economic anchor** of the sub-region.
- **Botswana** = political stability + diamonds.
- **Namibia** = Namib Desert + Atlantic upwelling (Benguela Current).
- **Mozambique** = Indian Ocean coast; cyclone & gas relevance.
- **Lesotho** is an **enclave** country (completely surrounded by South Africa).

Physical Geography Anchors

- **Kalahari Desert** (Botswana–Namibia–South Africa)
- **Drakensberg Mountains** (South Africa–Lesotho).
- **Rivers: Zambezi, Limpopo, Orange**

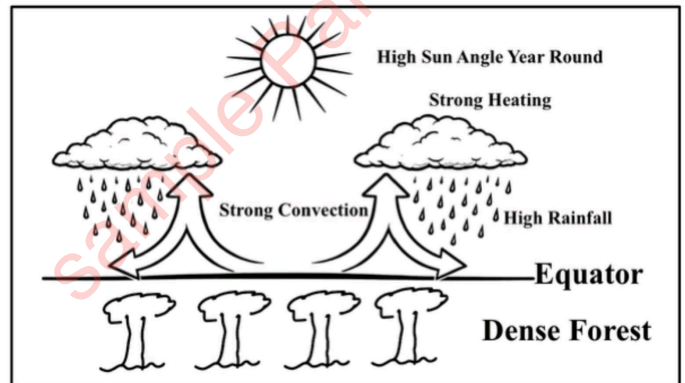
Equator + Tropics: The Latitude Framework (The “Climate Skeleton”)

A. Equator (0°): Cuts Africa almost through the middle African Countries Through Which the Equator Passes

(West → East direction)

1. **São Tomé and Príncipe**
 - Equator passes through Ilhéu das Rolas (small islet)
2. **Gabon**
3. **Republic of the Congo** (*Congo-Brazzaville*)
4. **Democratic Republic of the Congo** (*DR Congo*)

5. **Uganda**
6. **Kenya**
7. **Somalia**



UPSC Hook:

- Equator = high sun angle year-round → strong heating → strong convection high-rainfall **Dense Forest**

- **big rivers (Congo)**

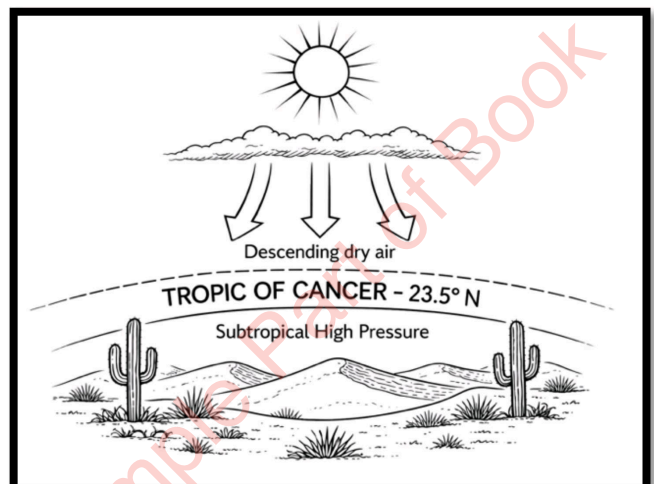
So when UPSC mentions: “dense rainforest” / “equatorial climate” / “highest discharge” → your brain should go **Equator belt** → **Congo Basin**.

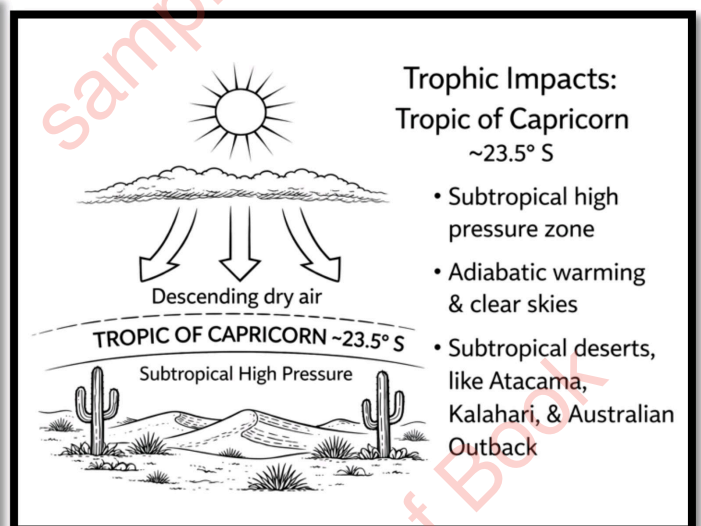
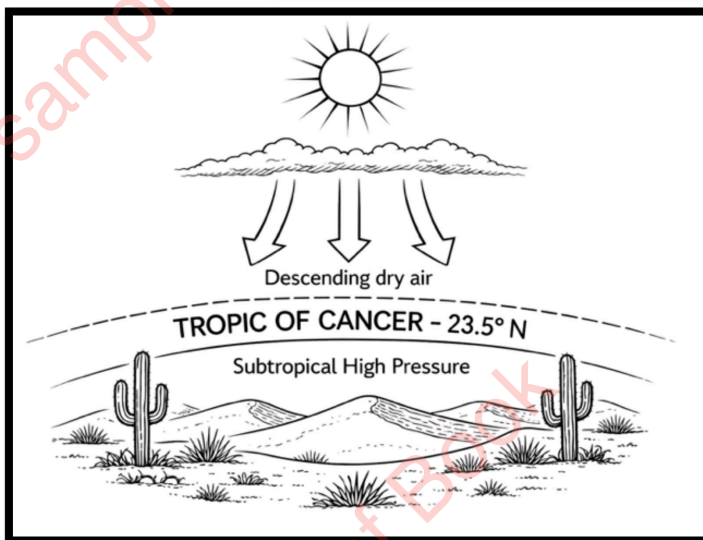
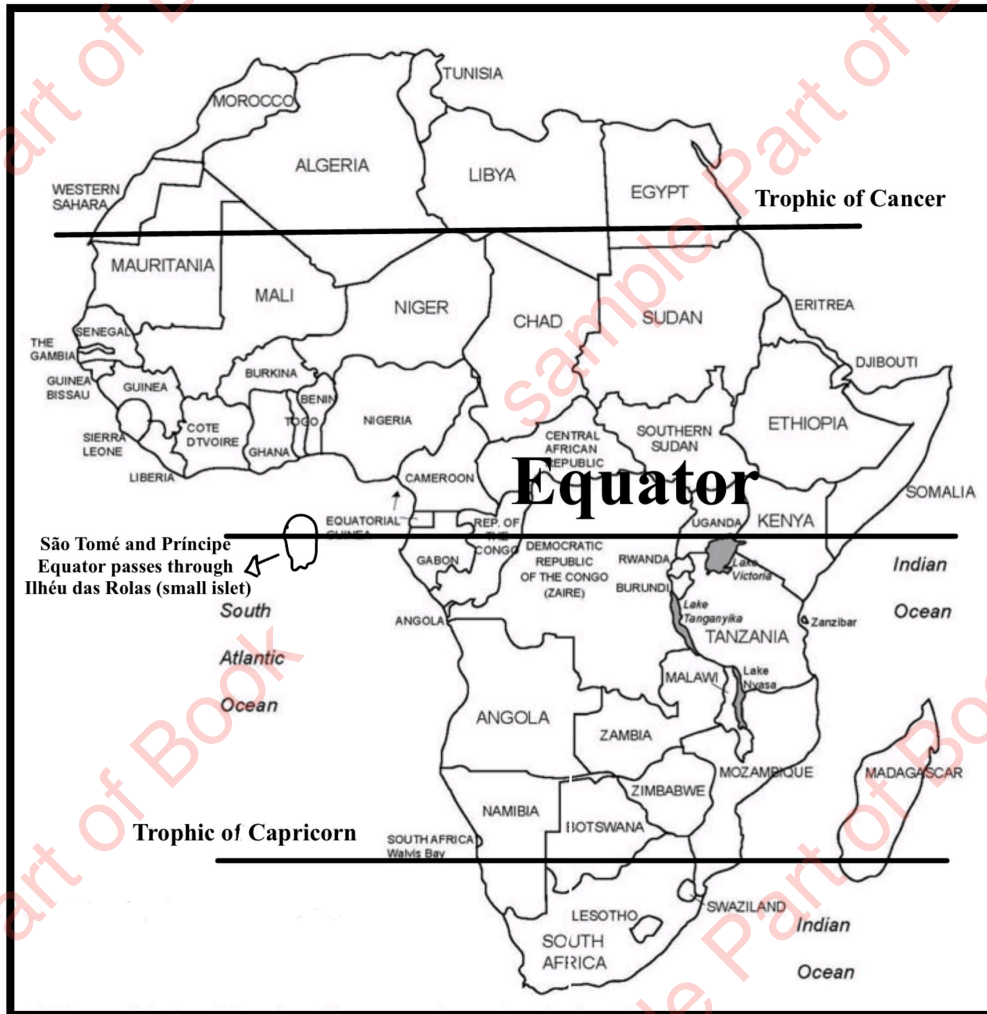
UPSC Hook

- **✗ Equatorial Guinea** → *Despite the name, the Equator does NOT pass through it*
- **✗ Nigeria** → Lies completely **north** of the Equator
- **✓ Equator crosses both land & islands** (São Tomé is often ignored)

Geographical Significance

- **Dense equatorial rainforests** (Congo Basin)
- High rainfall, convectional rains
- Low annual temperature variation
- Supports:
 - Congo rainforest
 - Lake Victoria basin (near-equatorial influence)





B. Tropic of Cancer (~23.5°N): Crosses North Africa

What it tells you instantly:

- This is the latitude belt of **subtropical high pressure** dominance.
- That means:
 - i. descending dry air
 - ii. clear skies
 - iii. deserts

So Tropic of Cancer across Africa strongly aligns with: **Sahara desert belt**

UPSC Hook: If a statement says “Tropic of Cancer passes through tropical rainforest in Africa” → instantly false.

African Countries Crossed by the Tropic of Cancer

(West → East order)

1. **Western Sahara** (shown separately on maps)
2. **Mauritania**

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3. **Mali**
4. **Algeria**
5. **Niger**
6. **Libya**
7. **Egypt**

C. Tropic of Capricorn (~23.5°S): Crosses Southern Africa

African Countries Crossed by the Tropic of Capricorn

(West → East order)

1. **Namibia**
2. **Botswana**
3. **South Africa**
4. **Mozambique**

Geographical Significance

- Marks the **southern limit of the Tropics**
- Explains:
 - **Kalahari Desert** & semi-arid climate
 - Subtropical high-pressure belt influence
 - Seasonal reversal of solar overhead position
 - marks **subtropical dry zones** in the southern hemisphere too.
 - Namib coastal desert (extra dryness due to cold current)
 - Dry belts in southern Africa

So the tropics help you build a **climate logic** without memorising climate maps

The Surrounding Waters: Mediterranean, Red Sea, Atlantic, Indian (The “Border Logic”)

A. Mediterranean Sea (North)

Importance:

- Separates Africa from Europe.
- Along it you get **Mediterranean climate** (mild wet winters, dry summers).
- It frames North Africa countries: **Morocco, Algeria, Tunisia, Libya, Egypt**.

UPSC Hook: “Mediterranean coast + Atlas influence + winter rainfall” type conceptual questions.

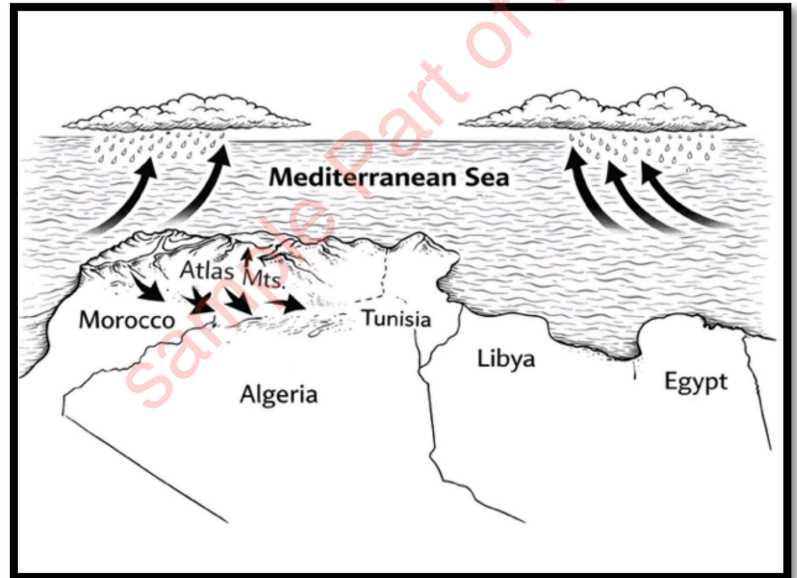
B. Red Sea (Northeast)

Importance:

- Between Africa and Arabian Peninsula.
- It leads up to the **Suez Canal** (Egypt) connecting to the Mediterranean.

Why Hook:

- One of the world’s key shipping corridors: **Indian Ocean → Red Sea → Suez → Mediterranean → Europe**



- Anything about **Horn of Africa, piracy, naval bases, Yemen conflict effects** often links here.

C. Atlantic Ocean (West)

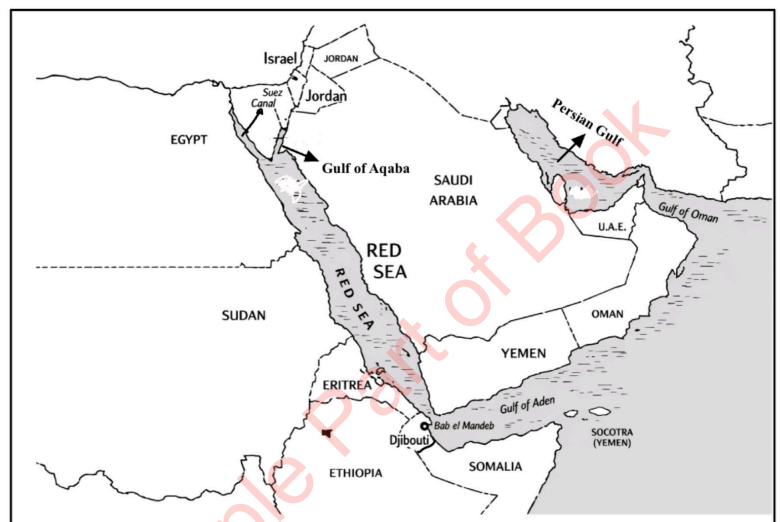
Importance:

- West Africa coastline faces the Atlantic.
- Key regions:
 - **Gulf of Guinea** (bulge area): oil + ports + piracy
 - Northwest Africa: influenced by **cold Canary current** (dryness)

D. Indian Ocean (East)

Importance:

- East and Southeast Africa face the Indian Ocean.
- It connects to:
 - Arabian Sea
 - Bay of Bengal via Indian Ocean circulation



- major sea lanes near East Africa

Ocean Currents Around Africa

Africa is influenced by **two ocean systems**:

- **Atlantic Ocean (West & South-West Africa)**
- **Indian Ocean (East & South-East Africa)**

Each has **warm & cold currents** with **direct climate, fisheries, desert, and rainfall implications**.

ATLANTIC OCEAN CURRENTS (WEST AFRICA SIDE)

1. **Canary Current (Cold)**
 - **Flows:** North → South
 - **Along:** Morocco, Western Sahara
 - **Impact:**
 - Cooling of air
 - **Aridity → Sahara Desert**
 - Rich fisheries (upwelling)

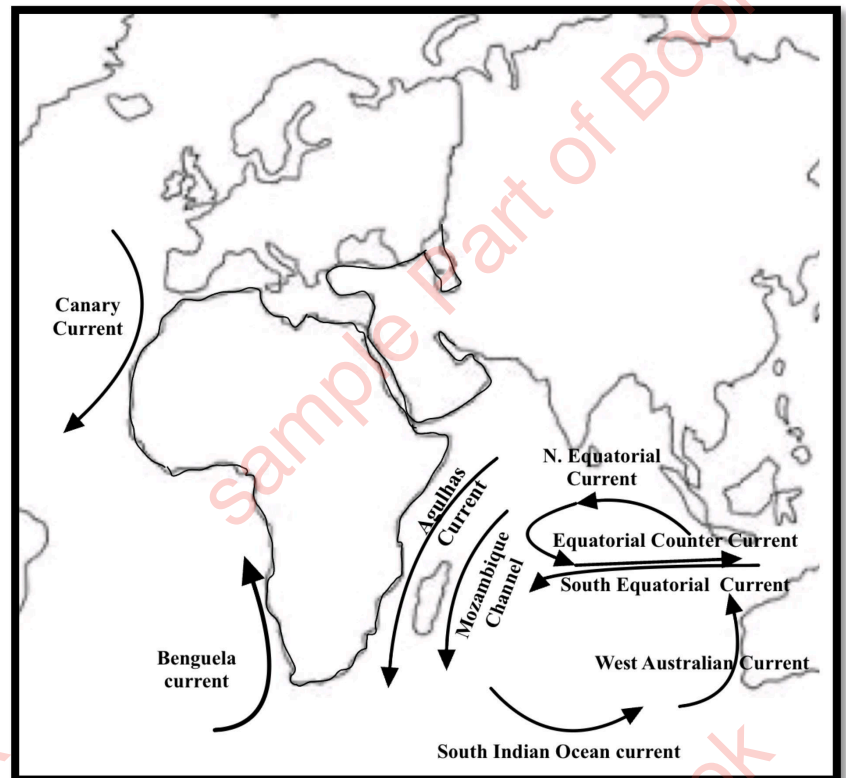
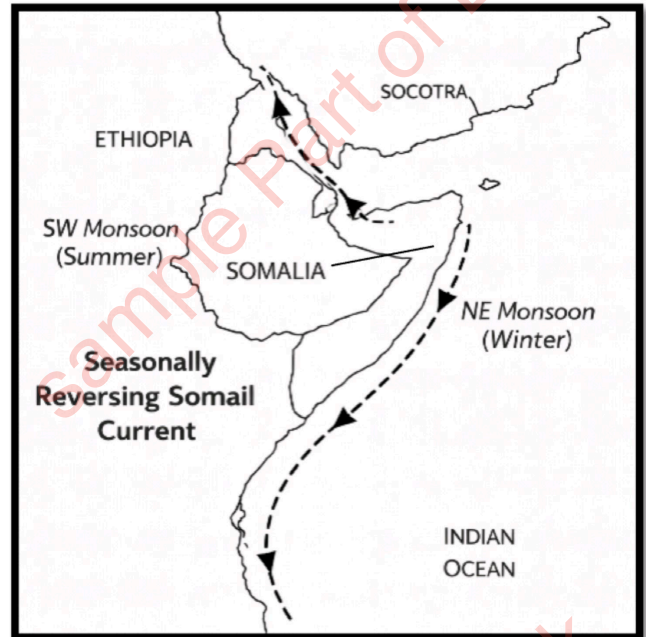
Parallel: Benguela current effect in south

2. **Guinea Current (Warm)**
 - **Flows:** West → East
 - **Along:** Gulf of Guinea (Nigeria, Ghana)
 - **Impact:**
 - High humidity
 - Heavy rainfall
 - Dense forests
3. **Benguela Current (Cold – VERY IMPORTANT)**
 - **Flows:** South → North
 - **Along:** Namibia, Angola
 - **Impact:**
 - **Namib Desert**
 - One of world's richest fishing zones
 - Fog-dominated coast

UPSC Hook: "Cold current + desert paradox"

INDIAN OCEAN CURRENTS (EAST AFRICA SIDE)

1. **Mozambique Current (Warm)**
 - **Flows:** North → South
 - **Between:** Mozambique & Madagascar
 - **Impact:** Warm, moist coastal climate
2. **Agulhas Current (Warm & Strong)**
 - **Flows:** North → South
 - **Along:** East coast of South Africa
 - **Impact:**
 - Warmer climate
 - Influences Agulhas leakage into Atlantic
3. **Somali Current (Seasonal – UNIQUE)**
 - **Flows:**
 - **Summer:** South → North
 - **Winter:** North → South



- **Reason:** Monsoon wind reversal
- **Impact:**
 - Upwelling
 - High marine productivity

UPSC Hook: ONLY major current in world that reverses completely

Africa's BIG physical structure (the real "master key")

Atlas Mountains

- Countries: Morocco, Algeria, Tunisia (extension)
- located in the Maghreb region.
- Types:
 - High Atlas
 - Middle Atlas
 - Anti-Atlas
- **UPSC Hook:**
 - Barrier to moist winds
 - Rainfall on windward side → agriculture
 - Rain-shadow towards Sahara

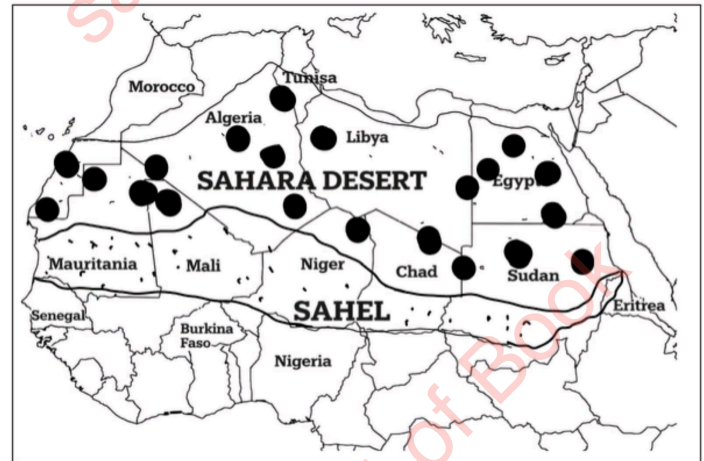
Maghreb Region: Problems & Terrorist Groups — Most Important UPSC Points

1. **Core Security Problem:** The Maghreb lies at the junction of **Mediterranean North Africa** and the **Sahel**, making it highly vulnerable to **terrorism spillover from the Sahara–Sahel belt**.
2. **Geographical Constraint:** Vast deserts, porous borders, and weak state presence make surveillance and counter-terror operations difficult.
3. **Post-Arab Spring Instability:** Political upheavals weakened institutions, especially in **Libya**, creating power vacuums exploited by extremist groups.
4. **Libya Factor:** Collapse of Libya led to **arms proliferation**, strengthening militant networks across Algeria, Tunisia, Mali, and Niger.
5. **Economic Stress:** Youth unemployment, regional inequality, and marginalisation of desert communities fuel radicalisation.
6. **Organised Crime Nexus:** Terror groups finance operations through **arms smuggling, drug trafficking, kidnapping, and human trafficking**.
7. **Al-Qaeda in the Islamic Maghreb (AQIM):**
 - Most prominent group in the region.
 - Originated in Algeria; operates across Maghreb–Sahel.
 - Uses desert routes for transnational attacks.
8. **Islamic State in the Greater Sahara (ISGS):**
 - ISIS-linked group active near Maghreb–Sahel borders.
 - Focuses on attacks against security forces and civilians.
9. **Regional Rivalries:** **Morocco–Algeria tensions** (Western Sahara issue) weaken regional counter-terror cooperation.

UPSC hook: "Maghreb's terrorism problem is geography driven deserts + weak states + Sahel spillover."

Sahara–Sahel Belt

It is a **north–south transitional ecological and climatic belt** in Africa where the **Sahara Desert** (hyper-arid) gradually changes into the **Sahel** (semi-arid). Think of it as **Africa's climate gradient**, not a sharp boundary.



Latitudinal Arrangement (North → South)

1. **Sahara Desert**
 - Extremely arid
 - < 100 mm rainfall/year
 - Sand dunes (ergs), rocky plateaus (hamadas)
2. **Sahara–Sahel Transition**
 - Occasional rainfall
 - Seasonal grasses
 - Highly fragile ecosystem

3. Sahel Belt

- 200–600 mm rainfall/year
- Short rainy season
- Grasslands with scattered trees (acacia)

Countries Covered (West → East)

- Mauritania
- Mali
- Niger
- Chad
- Sudan

UPSC favourite: These are also **politically fragile states**.

Climate Logic (Why this Belt Exists)

Atmospheric Factors

- Subtropical High Pressure (descending dry air)
- Seasonal movement of **ITCZ**

Oceanic Influence

- Cold currents (Canary) reduce moisture supply in the west

Result: Erratic rainfall + frequent droughts.

Vegetation & Livelihood

Zone	Vegetation	Livelihood
Sahara	Almost none	Nomadism
Transition	Sparse grass	Pastoralism
Sahel	Grass + shrubs	Agro-pastoral

Major Issues

Desertification

- Southward expansion of Sahara
- Overgrazing + climate change

Conflict & Instability

- Resource scarcity → conflicts
- Terrorism hotbed (Sahel region)

Migration

- Climate refugees towards North Africa & Europe

WEST AFRICAN HIGHLANDS

The **West African Highlands** form a **discontinuous highland belt** in western Africa, mainly across:

- Guinea
- Sierra Leone
- Liberia
- Ivory Coast (western part)

They act as the **water tower of West Africa**.

Major Highland Units

Fouta Djallon Highlands (MOST IMPORTANT)

- **Location:** Guinea
- **Average height:** ~900–1,500 m
- **Rock type:** Ancient crystalline rocks
- **Significance:**
 - Source region of **many major West African rivers**
 - Known as “*Hydrological heart of West Africa*”

Guinea Highlands (Broader zone)

- Includes plateaus & residual hills
- Heavily weathered old mountains
- Rich in **bauxite** and iron ore

Climatic Role of Highlands

- Force **orographic rainfall**
- Higher rainfall than surrounding plains
- Support dense vegetation & agriculture

NIGER BASIN

The Niger River

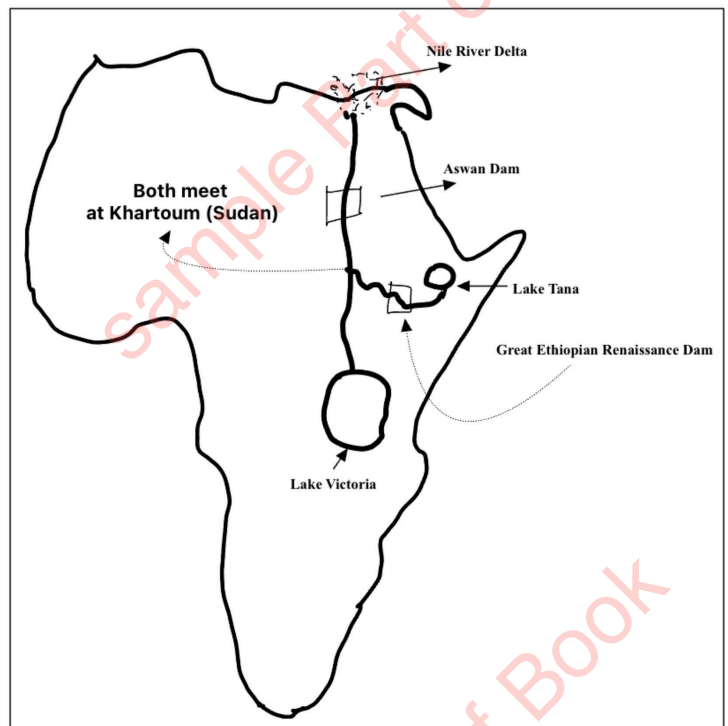
- **Length:** ~4,180 km (3rd longest in Africa)
- **Source:** Fouta Djallon Highlands (Guinea)
- **Mouth:** Gulf of Guinea (Nigeria)

Boomerang / Crescent-Shaped Course (VERY IMPORTANT)

Instead of flowing straight to the Atlantic:

1. Flows **north-east into Mali**
2. Enters **hot, dry interior**
3. Turns sharply **south-east**
4. Finally drains into **Nigeria**

UPSC Hook: “Why does Niger flow away from the sea initially?”



Reason:

- Ancient uplift of coastal areas
- Lower interior basin levels
- Structural control of old landmass

Countries in the Niger Basin

- Guinea
- Mali
- Niger
- Nigeria
- Benin (tributaries)

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The East African Rift is a **linear zone of crustal extension** extending for ~6,000 km from the **Afar region of Ethiopia** to **Mozambique**, marked by:

- Rift valleys (grabens)
- Normal faulting
- Volcanism
- Deep linear lakes

It represents an **early stage of continental breakup**, which may eventually lead to the formation of a **new ocean basin**.

1. Plate Tectonic Framework (Conceptual Core)

- The African Plate is splitting into:
 - **Nubian Plate** (western part)
 - **Somali Plate** (eastern part)
- Relative movement: **divergent (tensional)**
- Rate: a few **millimetres per year**

UPSC Hook: *East African Rift is a continental divergent plate boundary.*

2. Afar Triangle – Triple Junction (Very High Yield)

Located in **NE Ethiopia**, it is the meeting point of **three rifts**:

1. **Red Sea Rift**
2. **Gulf of Aden Rift**
3. **East African Rift**

Significance:

- One of the **few active continentals triple junctions** on Earth
- Shows transition from **continental rifting** → **oceanic spreading**
- Region of **intense volcanism** (e.g., Erta Ale)

Two Major Branches of the Rift

A. Eastern Rift (Gregory Rift)

Route: Ethiopia → Kenya → Tanzania

Key characteristics

- Strong **volcanism**
- Thinner crust
- High heat flow
- Linear chain of volcanoes

Major volcanoes

- **Erta Ale**
- **Mount Kenya**
- **Mount Kilimanjaro**
- **Ol Doinyo Lengai**

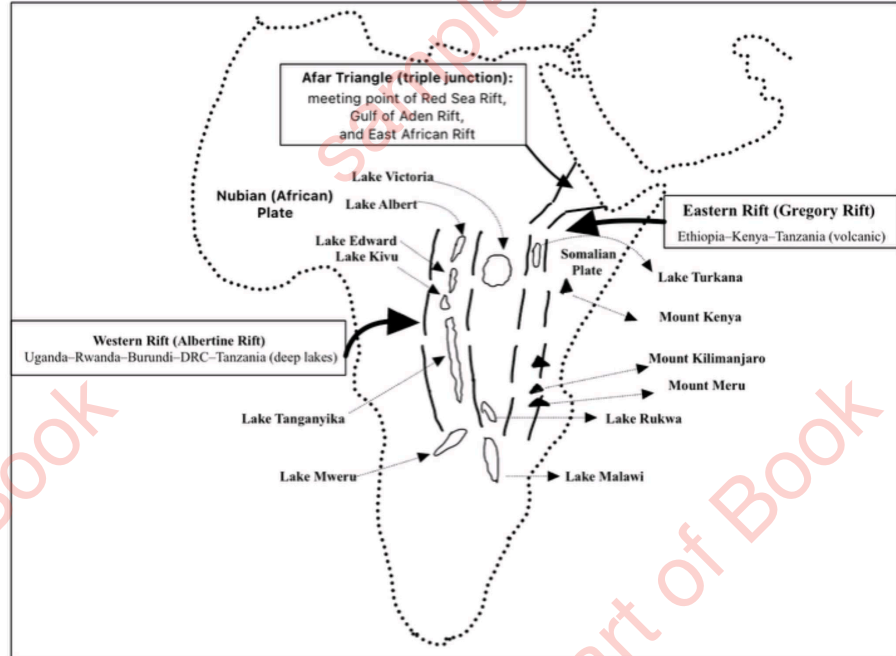
Dominated by volcanism rather than lakes.

B. Western Rift (Albertine Rift)

Route: Uganda → Rwanda → Burundi → DRC → Tanzania

Key characteristics

- Deep fault-bounded basins



- Very deep **freshwater lakes**
- Comparatively **less surface volcanism**

Major rift lakes

- **Lake Albert**
- **Lake Edward**
- **Lake Kivu**
- **Lake Tanganyika** (deepest in Africa)
- **Lake Malawi**

Dominated by lakes rather than volcanoes.

Important Mountains & Volcanoes of the East African Rift (UPSC-High Yield)

Eastern Rift (Gregory Rift) – Volcanism Dominant: (Ethiopia → Kenya → Tanzania)

1. **Erta Ale** — Ethiopia (Afar)
 - Active **shield volcano** with a **persistent lava lake**
 - Classic marker of active **continental rifting**
2. **Mount Kenya** — Central Kenya
 - **Extinct stratovolcano**, Africa's **2nd highest peak**
 - Lies on the **Eastern Rift axis**
3. **Mount Kilimanjaro** — NE Tanzania
 - Africa's **highest peak**; rift-related, not subduction
 - Composed of **Kibo, Mawenzi, Shira**
4. **Mount Meru** — Near Arusha, Tanzania

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- Active stratovolcano; often asked with Kilimanjaro pairing
- 5. **Ol Doinyo Lengai** — *Tanzania*
 - **World's only active carbonatite volcano**
 - Very distinctive UPSC fact

Western Rift (Albertine Rift) – Lakes Dominant, Limited Volcanism
(*Uganda → Rwanda → Burundi → DRC → Tanzania*)

1. Mount Nyiragongo — *DR Congo*

- One of the **most active** volcanoes globally

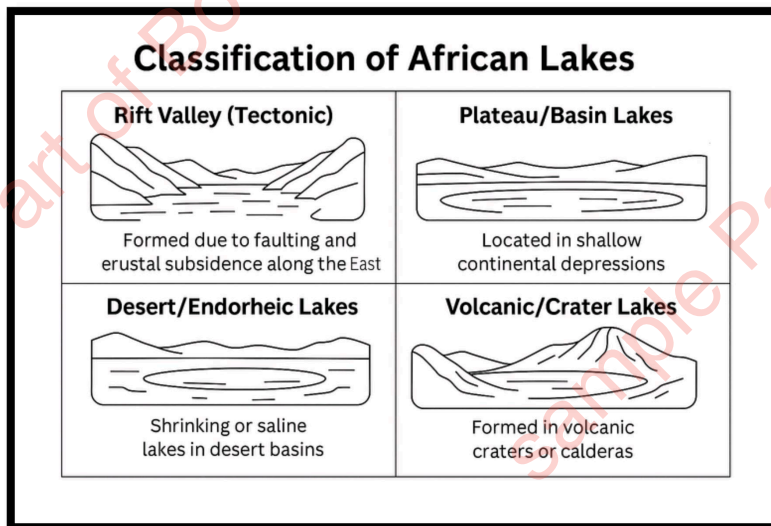
- Famous **lava lake**; exception within Western Rift
- 7. **Mount Nyamuragira** — *DR Congo*
 - Africa's **most active** volcano by eruptions
 - Basaltic, fissure-fed eruptions

Exam Memory Hook

- **Eastern Rift = Volcano chain** → *Erta Ale → Mt. Kenya → Kilimanjaro → Meru → Ol Doinyo Lengai*
- **Western Rift = Deep lakes** → volcanism **rare** (Nyiragongo/Nyamuragira are exceptions)

Lakes of Africa

Africa has some of the **largest, deepest, oldest, and most geopolitically important lakes in the world**. For exams, lakes must be understood by **origin, region, river linkage, and environmental significance**.



Classification of African Lakes (MOST IMPORTANT FRAMEWORK)

Type of Lake	Formation Process	Key Features	Examples
Rift Valley (Tectonic)	Faulting and crustal subsidence along the East African Rift System	Deep, elongated lakes in rift valleys	Lake Tanganyika, Lake Malawi (Nyasa), Lake Turkana, Lake Albert, Lake Edward, Lake Kivu.
Plateau / Basin	Formed in shallow continental depressions	Broad, shallow lakes on plateaus	Lake Victoria (largest by area), Lake Chad
Desert / Endorheic	Located in arid basins, often shrinking or saline	Saline or shrinking lakes in deserts	Lake Chad (shrinking, endorheic)
Volcanic / Crater	Formed in volcanic craters or calderas	Small, deep lakes in volcanic craters	Lake Tana (Ethiopia), Lake Natron (Tanzania), Lake Magadi (Kenya)

Major Rift Valley Lakes (Highest UPSC Weight)

Lake	Countries	Key UPSC-Relevant Facts
Lake Tanganyika	Tanzania, DRC, Burundi, Zambia	• 2nd deepest lake in the world (after Baikal) • Among oldest freshwater lakes • Very high fish endemism • Lies in Western Rift (Albertine Rift)

Lake Malawi (Nyasa)	Malawi, Tanzania, Mozambique	• One of the most biodiverse lakes on Earth • Long, narrow rift-controlled basin • Classic East African Rift lake
Lake Turkana	Kenya, Ethiopia	• Largest desert lake in the world • Slightly alkaline • Strong link with human evolution sites
Lake Albert	Uganda, DRC	• Part of the Nile system • Receives water from Lake Edward
Lake Edward	Uganda, DRC	• Connected to Lake Albert by Semliki River • Lies in Western Rift
Lake Kivu	Rwanda, DRC	• Contains large quantities of dissolved methane & CO₂ • Potential geohazard + energy resource

Plateau / Basin Lakes

Lake	Countries	Key UPSC-Relevant Facts
Lake Victoria	Uganda, Kenya, Tanzania	• Largest lake in Africa (by area) • Source of White Nile • NOT a Rift Valley lake (very frequent UPSC trap)

Desert & Endorheic Lakes

Lake	Countries	Key UPSC-Relevant Facts
Lake Chad	Chad, Nigeria, Niger, Cameroon	• Endorheic (no outlet) • Rapidly shrinking • Vital for Sahelian livelihoods • Linked to climate change + security issues

Alkaline / Soda Lakes (Eastern Africa)

Lake	Country	Key UPSC-Relevant Facts
Lake Natron	Tanzania	• Highly alkaline • Major flamingo breeding ground
Lake Magadi	Kenya	• Soda ash production • Extreme alkalinity

Volcanic / Crater & Highland Lakes

Lake	Country	Key UPSC-Relevant Facts
Lake Tana	Ethiopia	• Source of the Blue Nile • Volcanic plateau lake • Hydrologically critical for Egypt–Sudan–Ethiopia relations

River–Lake Linkages (VERY IMPORTANT FOR PRELIMS)

River System	Associated Lakes
Nile	Victoria → Albert → Tana
Congo	Tanganyika (indirect)
Rift System	Tanganyika, Malawi, Turkana
Inland Drainage	Chad

Comparative UPSC Traps (MEMORISE)

Question Trap	Correct Answer
Largest lake by area in Africa	Lake Victoria
Deepest lake in Africa	Lake Tanganyika
Most biodiverse lake	Lake Malawi
Shrinking desert lake	Lake Chad
NOT a rift lake	Lake Victoria

ONE LINE MEMORY HOOK: “Africa is slowly tearing itself apart along the Rift.”

Chapter 4 Asia

Asia is the **central geopolitical theatre of the 21st century**, hosting the world's largest population, fastest-growing economies, major energy reserves, and most sensitive strategic chokepoints. Its geopolitical importance arises not from political boundaries alone but from the **spatial arrangement of land, seas, resources, and routes**, best understood through maps.

Asia's location at the junction of **Europe, Africa, and the Pacific** makes it a natural pivot of global power. Mountain barriers shape security frontiers, tectonic belts generate instability, and surrounding seas and straits regulate global trade and energy flows. The contrast between **continental Asia (land power)** and **maritime Asia (sea power)** further defines strategic competition and alliance systems.

Resource concentration, water dependence on Himalayan rivers, and control over maritime commons convert geography into strategic leverage. Therefore, introducing Asia through a **map-based geopolitical framework** is essential to connect physical geography with **power politics, security dynamics, and global governance**, as demanded by UPSC's integrated approach.

In Asia, maps do not merely show space—they explain power.

Plate Tectonics and Asia — A Concise, Map-Based Explanation

Asia's physical and geopolitical structure is fundamentally controlled by **plate tectonics**. The continent lies at the junction of multiple active plates, making it the **most tectonically dynamic region on Earth**.

1. Indian–Eurasian Plate Collision (Convergent Boundary)

- The **northward-moving Indian Plate** collided with the **Eurasian Plate**.
- Resulted in the **Himalayas** and the **Tibetan Plateau**.
- Continues to cause **earthquakes** in Nepal, Kashmir, and Northeast India.
- **Geopolitical impact:** Natural barriers, climate control (monsoon), water security via Himalayan rivers.

2. Pacific Plate Margins (Ring of Fire)

- Eastern and Southeast Asia lie along the **Pacific Ring of Fire**.
- Subduction creates **volcanoes, earthquakes, island arcs, and tsunamis**.
- Regions affected: Japan, Philippines, Indonesia.
- **Strategic impact:** Disaster vulnerability, island geopolitics, maritime security.

3. West Asian Fault Systems (Transform & Convergent Zones)

- Interaction of **Arabian, Eurasian, and African plates**. Formation of **Zagros Mountains** and **Anatolian Fault**.
- High seismic risk in Iran and Turkey.
- **Geopolitical impact:** Infrastructure risk, energy corridor instability.

4. Stable Cratons and Interior Asia

- Central and North Asia sit on older, stable plate interiors.
- Produces **plateaus, basins, and continental climates**.
- Limited tectonic activity but harsh environments.

Why Plate Tectonics Matter for Asia

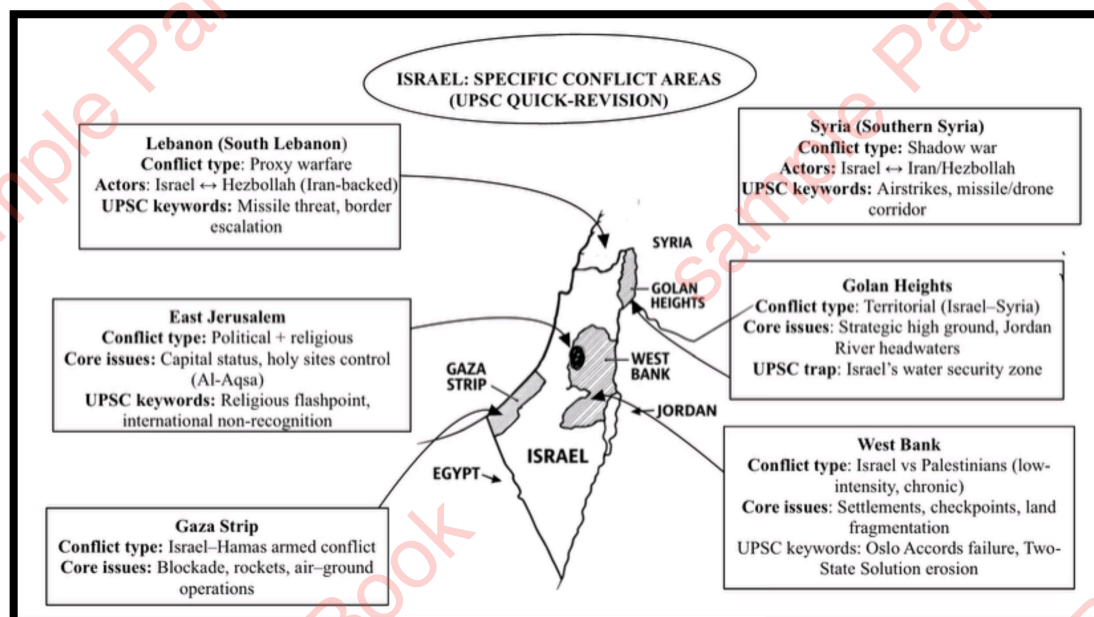
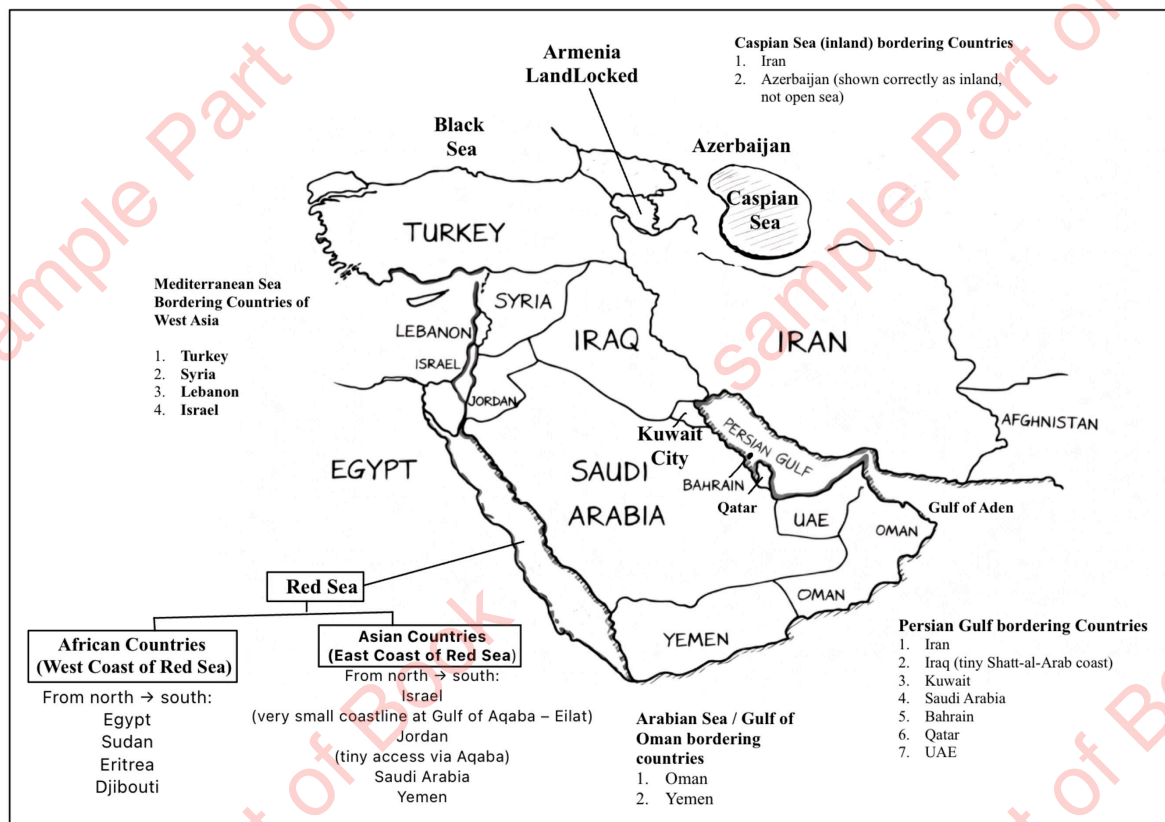
- Explains **mountain systems, climate patterns, river origins, disasters, and strategic borders**.
- Links **physical geography with geopolitics**, especially in border disputes, water security, and disaster diplomacy.

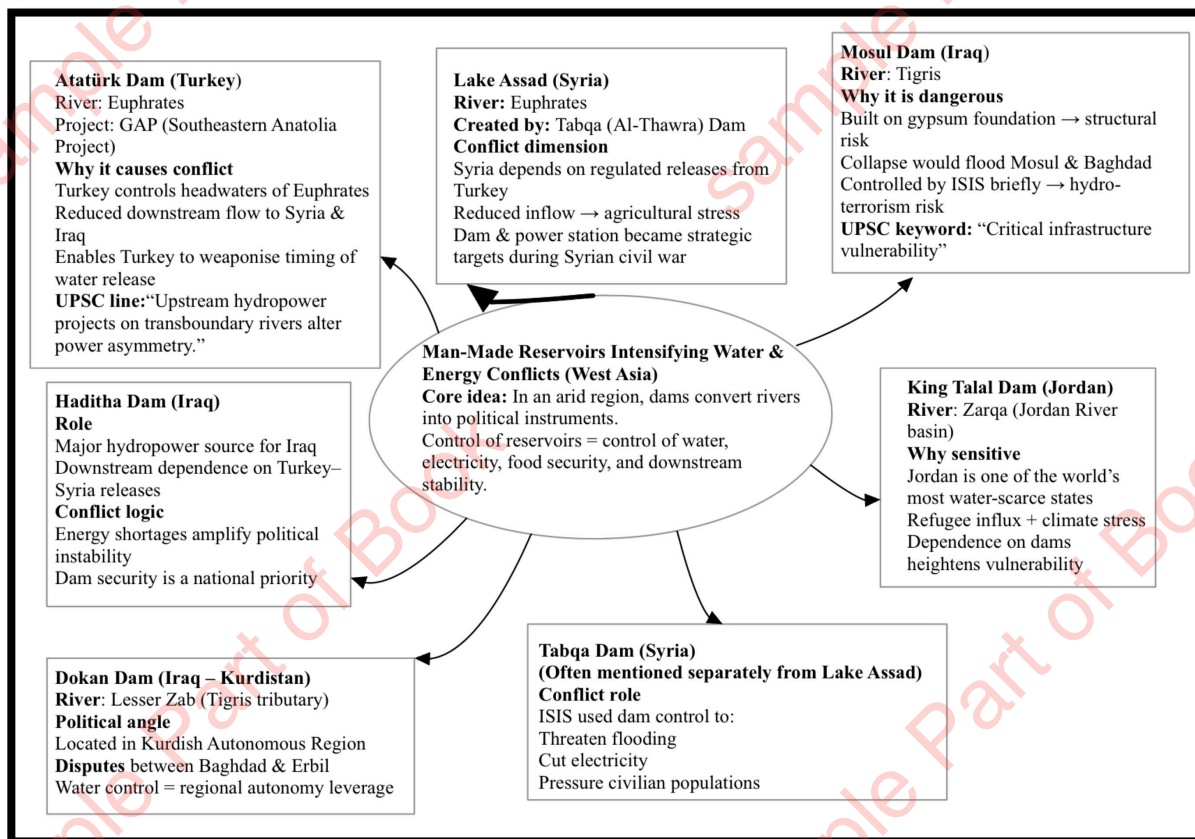
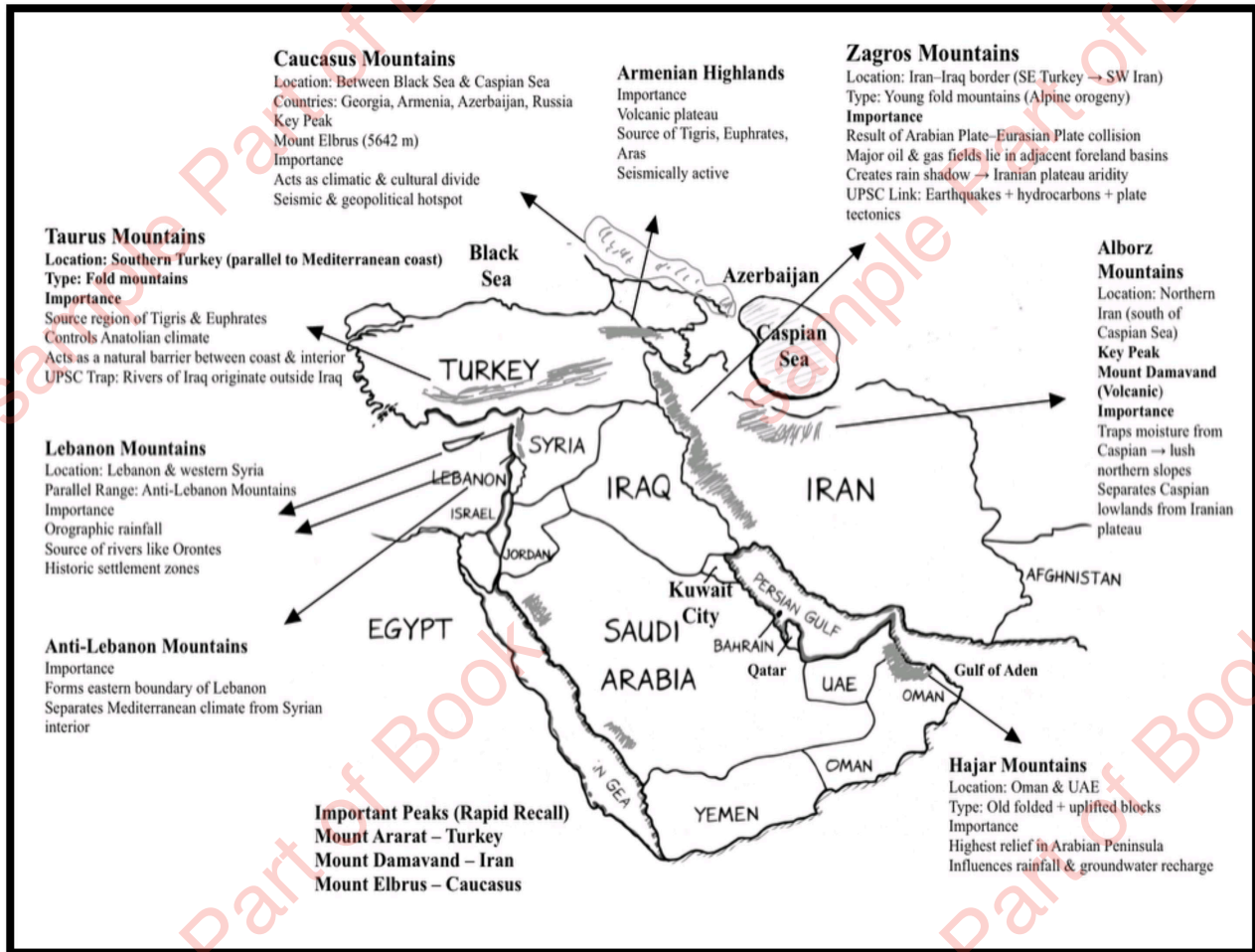
In Asia, plate boundaries are not just geological lines — they are lines of climate control, conflict, and strategic power.

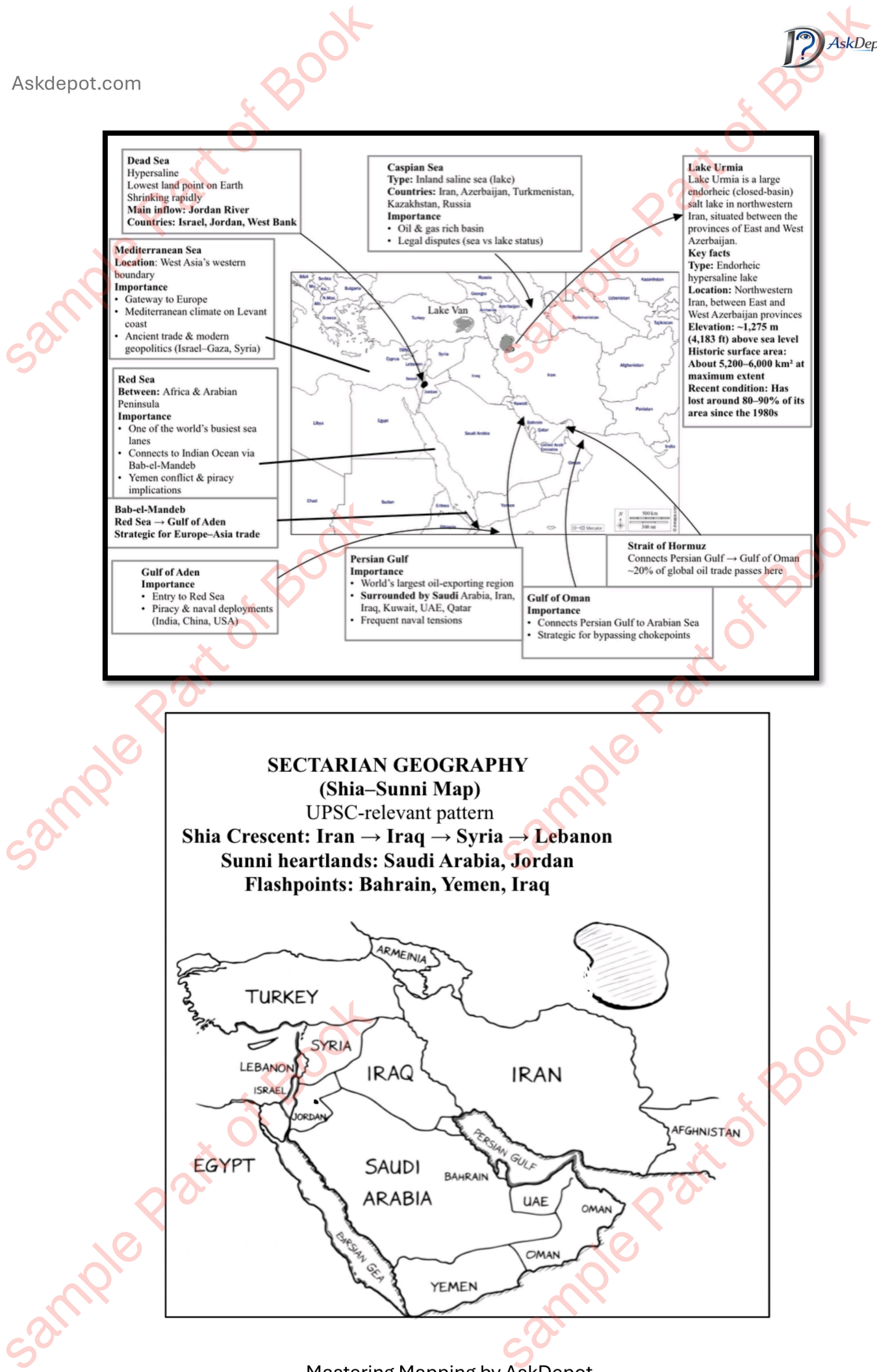
Asia is divided into SIX zones

Asia is divided into six zones because tectonics, climate, population distribution, resource geography, and geopolitics align regionally into six coherent spatial systems, making zonal study more logical and exam-relevant than political boundaries.

Zone	Countries	Why UPSC Loves It
West Asia (Middle East)	Saudi Arabia, Iran, Iraq, Israel	Oil, geopolitics
Central Asia	Kazakhstan, Uzbekistan	Silk Road, pipelines
South Asia	India, Pakistan, Sri Lanka	Monsoon, rivers
East Asia	China, Japan, Korea	Industry, tectonics
Southeast Asia	Indonesia, Philippines	Volcanoes, trade
North Asia	Siberia (Russia)	Climate extremes







UPSC-relevant pattern

UPSC-relevant pattern

Shia Crescent: Iran → Iraq → Syria → Lebanon

Sunni heartlands: Saudi Arabia, Jordan

Flashpoints: Bahrain, Yemen, Iraq



Chapter 5

Central Asia as a Geographical Core of Eurasia

Central Asia occupies the **geographical and geopolitical heart of Eurasia**, where physical geography directly shapes political power, economic relevance, and strategic vulnerability. Unlike coastal regions whose histories are driven by maritime access, Central Asia is a **landlocked continental core**, where relief, climate, water availability, and resource distribution act as the primary determinants of human settlement, state behaviour, and international competition. Therefore, mapping Central Asia for UPSC must be approached not as a memorisation of countries, but as an **interlinked spatial system**.

From a locational perspective, Central Asia lies at the intersection of **Russia, China, West Asia, and South Asia**, functioning historically as a bridge and buffer between major civilisational and power centres. This positioning explains why the region has remained central to global geopolitics—from the ancient Silk Route to modern energy corridors and China's Belt and Road Initiative. Any map-based study that ignores this connective logic risks reducing Central Asia to a static region, whereas UPSC consistently tests it as a **dynamic transit and influence zone**.

Physiographically, Central Asia is defined by a sharp contrast between **high mountain systems (Tien Shan, Pamir, Altai)** and **arid lowland basins**. This relief structure governs river origin, climate extremity, seismicity, and accessibility. Rivers such as the Amu Darya and Syr Darya originate in high glaciated zones but flow into arid interiors, culminating in endorheic basins like the Aral Sea. Consequently, water scarcity, irrigation dependence, and environmental degradation are not incidental issues but outcomes of geographic design—making drainage mapping indispensable for conceptual clarity.

Climatically, Central Asia exhibits one of the world's most **extreme continental regimes**, marked by hot summers, freezing winters, and minimal precipitation. Deserts such as the Karakum and Kyzylkum are not isolated features but expressions of distance from oceans, rain-shadow effects, and persistent high-pressure systems. UPSC often integrates this climatic logic with questions on agriculture, population distribution, and ecological stress, reinforcing the need for climate-relief overlay maps.

Resource geography further elevates the importance of Central Asia in contemporary world affairs. Vast reserves of **oil, natural gas, uranium, and strategic minerals**—especially in Kazakhstan and Turkmenistan—have transformed the region into an energy pivot linking

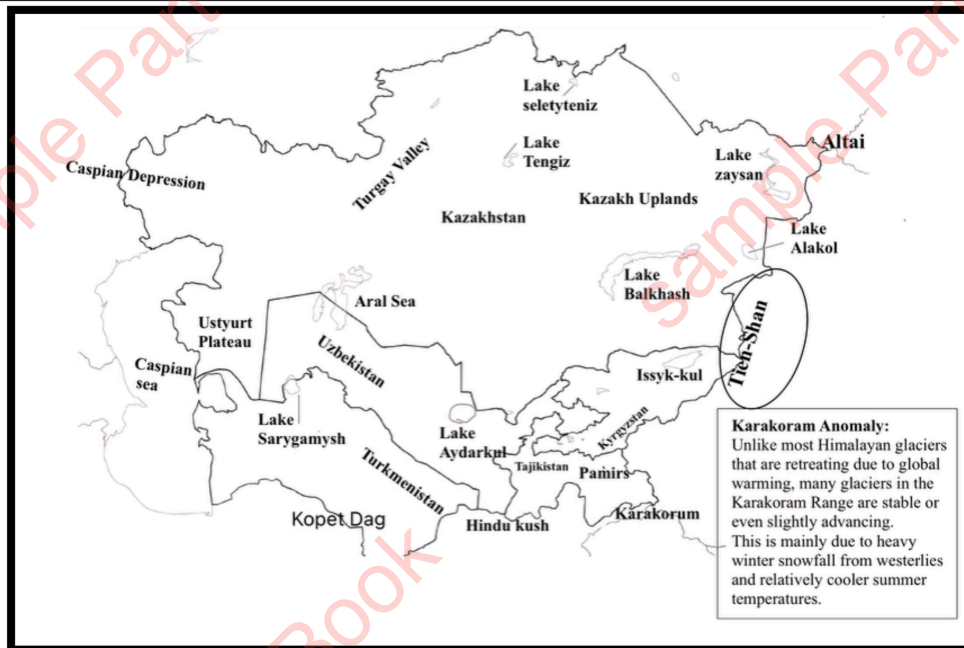
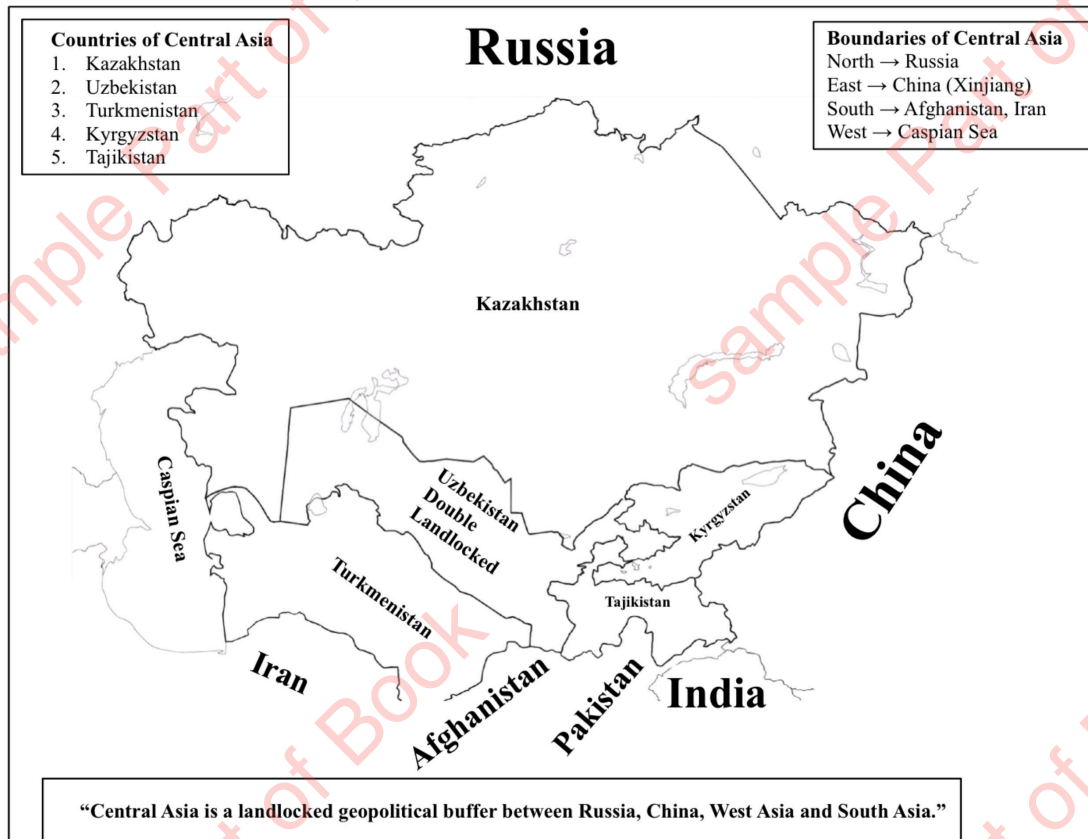
Europe, East Asia, and South Asia. Mapping pipelines, basins, and transport corridors thus becomes essential to understand great power rivalry, energy security, and India's strategic interests.

In essence, **Central Asia is a textbook example of geography acting as destiny**. For UPSC preparation, its mapping must proceed through a layered approach—**location → relief → drainage → climate → resources → geopolitics**—so that every feature on the map explains a broader political, economic, or environmental outcome. Only such a system-based mapping study aligns with the analytical depth demanded by Prelims, Mains, and Essay papers.

Countries of Central Asia (Core Political Units)

Central Asia consists of **five post-Soviet republics**, all landlocked:

Country	Capital	Political Note (UPSC Angle)
Kazakhstan	Astana	Largest country; borders Russia & China
Uzbekistan	Tashkent	Only double-landlocked country
Turkmenistan	Ashgabat	Gas-rich; Caspian Sea coast
Kyrgyzstan	Bishkek	Highly mountainous; China border
Tajikistan	Dushanbe	Pamir region; Afghanistan border



Political Boundaries & Neighbours (Must-Know)

External Neighbours

- **North:** Russia (cold continental influence)
- **East:** China (orographic barriers + westerlies interaction)
- **South:** Afghanistan–Iran (aridity & instability spillover)
- **West:** Caspian Sea (limited maritime moderation)

This relative isolation from oceans is critical for climate and aridity.

Internal Political Peculiarities

A. Double Landlocked Country

- **Uzbekistan**
 → Surrounded only by landlocked countries

B. Border Complexity (Ethnic Legacy)

- **Fergana Valley** (Uzbekistan–Kyrgyzstan–Tajikistan overlap)
- Ethnic Uzbeks, Tajiks, Kyrgyz mixed
- Source of **border tensions**

Shrinking Inland Sea	Aral Sea
Large Inland Lakes	Balkhash, Issyk-Kul
Ecological Case Studies	Aral Sea, Small Aral
Bird Wetlands	Alakol

Central Asia is dominated by endorheic (inland) water bodies, making the region extremely sensitive to river diversion, climate change, and geopolitical water stress.

Deserts of Central Asia & Reasons for Their Formation

Major Deserts of Central Asia

1. Karakum Desert

- **Location:** Turkmenistan
- **Meaning:** "Black Sand"
- **Between rivers:** Amu Darya (north) & Caspian basin (west)

UPSC Hook: Karakum Canal → water loss & salinisation

2. Kyzylkum Desert

- **Location:** Uzbekistan + Kazakhstan
- **Meaning:** "Red Sand"
- **Between rivers:** Amu Darya & Syr Darya

UPSC Hook: Inter river desert

3. Taklamakan Desert

- **Location:** Tarim Basin (China – Central Asian fringe)
- **One of world's largest sand deserts**
- **Encircled by mountains:** Tien Shan (N), Kunlun (S), Pamir (W)

4. Aralkum Desert

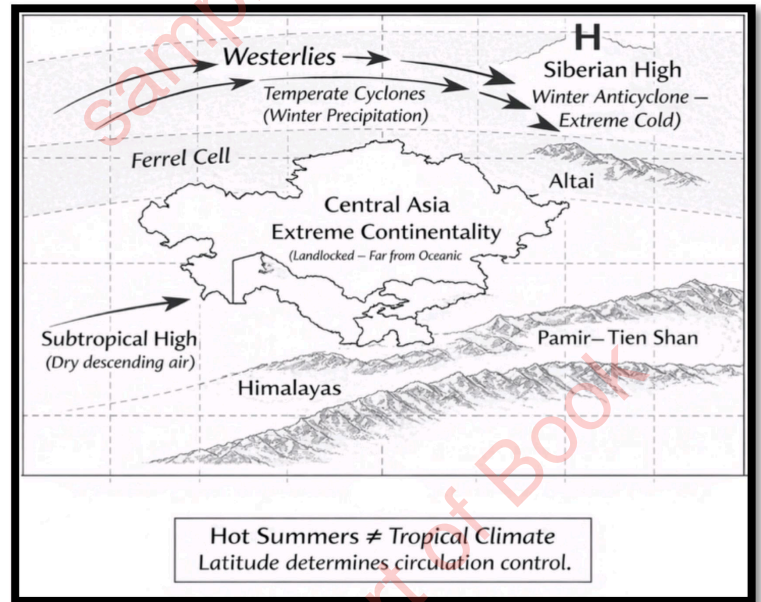
- **Location:** Former bed of Aral Sea
- **Youngest desert on Earth**
- **Man-made origin**

UPSC Hook: Ecological disaster + human geography

WHY Central Asia is Desert-Dominated (Core Concept)

1. Continentality (Distance from Sea)

- Central Asia is **landlocked**
- Moisture from oceans **dies out before reaching interior**

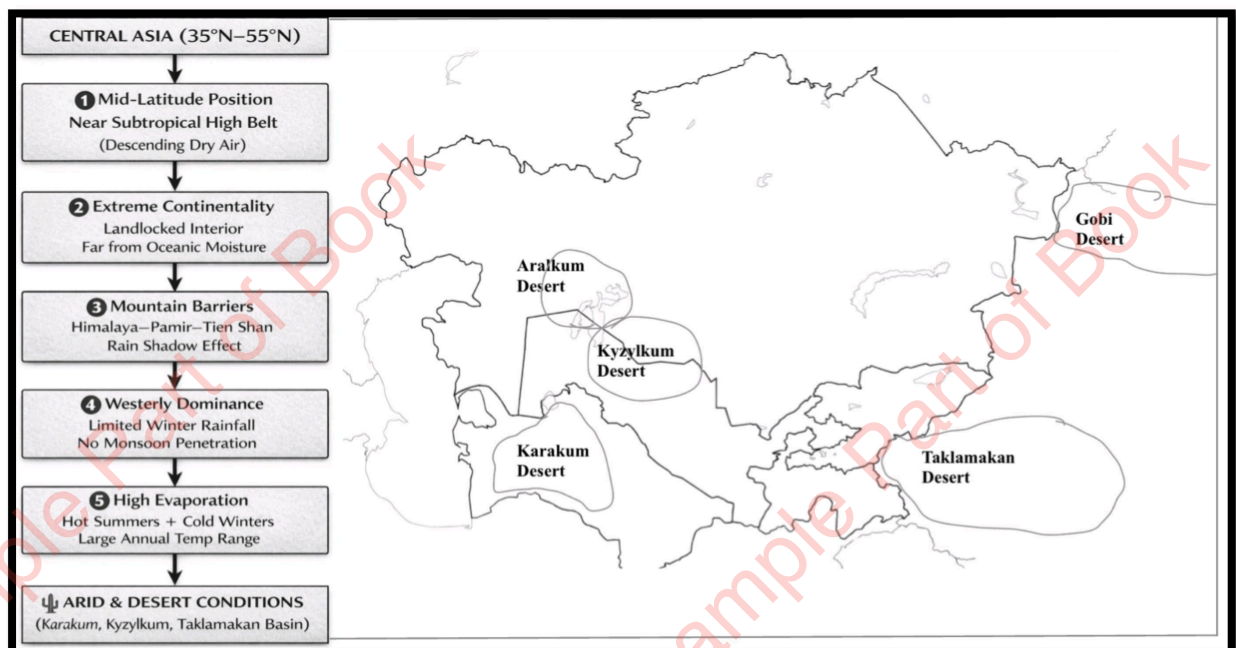


- → Very low rainfall

2. Rain Shadow Effect (MOST IMPORTANT)

Mountains block moisture:

- **Tien Shan**
- **Pamir**
- **Kunlun**
- **Hindu Kush**



Chapter 6

East Asia

Mapping East Asia is an exercise in understanding the spatial logic of one of the world's most dynamic regions. Located between roughly **20°N–55°N latitude** and **100°E–150°E longitude**, East Asia forms the eastern continental margin of Eurasia and includes **China, Mongolia, North Korea, South Korea, and Japan**.

The region represents a transition from continental interiors to Pacific island arcs, shaped by monsoon circulation, active plate boundaries, and heavily industrialized coastal belts. Its geography integrates **tectonic instability (Ring of Fire)**, **seasonal monsoon climate**, **fertile river plains**, **strategic seas**, and **major trade corridors**.

Thus, mapping East Asia is not merely locating countries; it is tracing the relationship between **latitude, relief, climate, tectonics, economy, and geopolitics**—a skill essential for analytical and examination-oriented geography.

Political Map of East Asia

Countries to mark (exam convention)

- China
- Mongolia
- North Korea
- South Korea
- Japan
- Taiwan (*often asked via strait/dispute framing*)

Seas & straits to label (minimum set)

- Yellow Sea
- East China Sea
- Sea of Japan
- Taiwan Strait
- Korea Strait

Borders & lines

- Korean DMZ (38°N approx.)
- China–Mongolia long land border
- Island arcs: Japan (Honshu–Hokkaido–Kyushu–Shikoku), Ryukyu chain (towards Taiwan)



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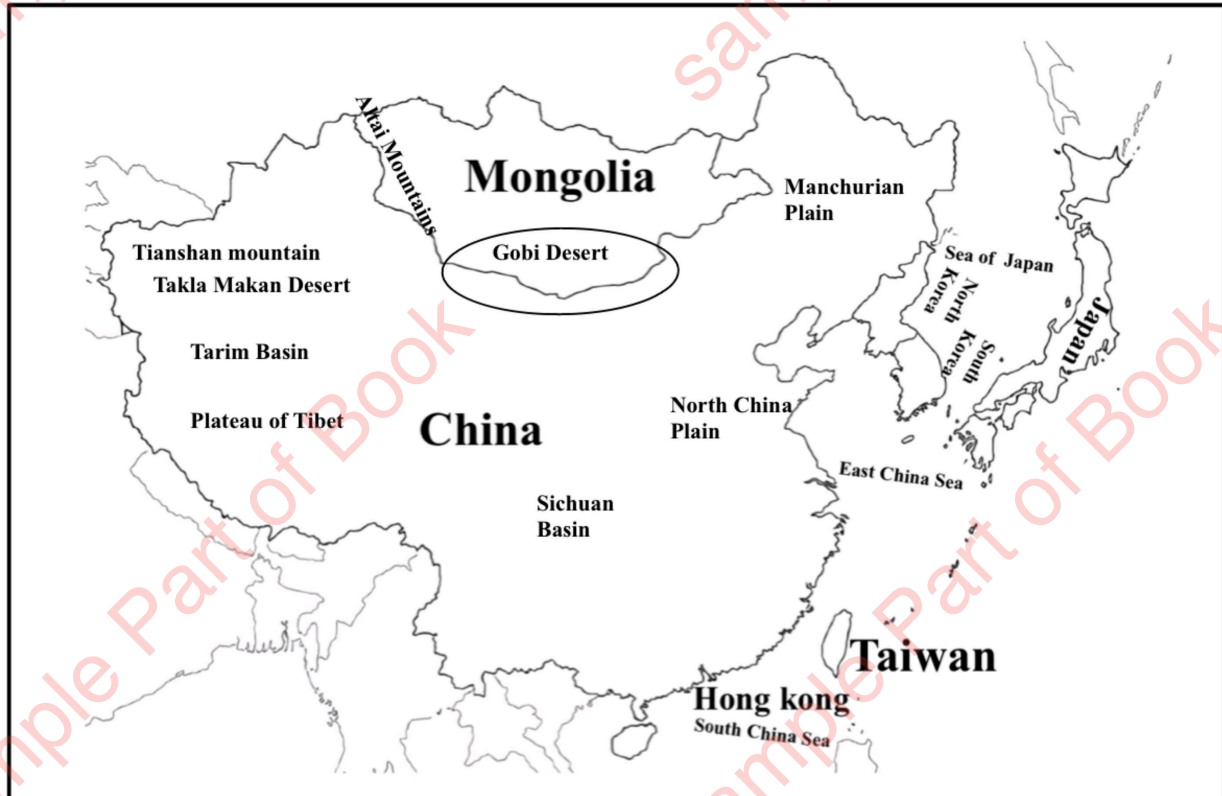
Physiographic Division of East Asia

East Asia is **physiographically** a continent-scale slope—high, cold, arid interiors in the west/north gradually descend to warm, humid, fertile lowlands in the east and southeast. This west→east gradient controls **climate, rivers, population, economy, and geopolitics**.

- Contains **Taklamakan Desert**
- Endorheic drainage (rivers disappear inland)

2. Gobi Desert

- Spreads across N China & S Mongolia
- Cold desert (not tropical!)
- Formed due to:
 - Rain shadow of mountains
 - Continentality
 - Winter high pressure



I. Northern & Western Highlands (Cold-Arid Core)

1. Central Asian–Mongolian Plateau

- Includes: **Mongolian Plateau**
- Elevation: ~900–1500 m
- Climate: Cold continental, arid to semi-arid
- Vegetation: Steppe grasslands
- Significance:
 - Source region of cold winter winds
 - Sparse population
 - Nomadic pastoralism

2. Altai–Sayan Mountain System

- Borders China–Mongolia–Russia
- Old fold mountains
- Acts as **climatic barrier** → blocks westerlies

UPSC Hook: Cold plateau + distance from sea = **continental climate dominance**

II. Interior Basins & Deserts (Rain-shadow Belt)

1. Tarim Basin

- Enclosed by:
 - **Tian Shan** (north)
 - Kunlun (south)

UPSC Hook: Gobi = cold desert not hot like Sahara

III. Mountain Chains of East Asia (Structural Backbone)

1. Tian Shan Ranges

- “Mountains of Heaven”
- Separate Central Asia from China proper
- Glaciated → snowmelt rivers

2. Greater & Lesser Khingan Ranges

- NE China
- Forested
- Important watershed divides

3. Japanese Alps

- Young fold mountains
- High seismic & volcanic activity
- Steep slopes → short, fast rivers

Link: Young mountains + subduction = earthquakes & volcanoes

Chapter 7

North Asia: Russia

North Asia largely corresponds to the **Asian part of the Russian Federation**, commonly known as **Siberia**. Unlike other regions of Asia, North Asia is dominated almost entirely by a single country—**Russia**—making its study inseparable from Russian geography. Russia is a **trans-continental state**, extending across both Europe and Asia, with the **Ural Mountains and associated physiographic features** forming the conventional continental boundary. While European Russia constitutes the political and demographic core, North Asia accounts for the greater share of Russia's area and natural resources. Therefore, for conceptual clarity and analytical convenience, **North Asia is best studied through an integrated treatment of Russia as a whole**, enabling a coherent understanding of its physical geography, climate, resources, and strategic significance.

2. Ural Mountains (Europe–Asia Divide)

North–South running range

- Old fold mountains (low height, eroded)
- Acts as **continental divide**
- Rich in **minerals** (iron, copper)
- Climatically weak barrier but politically important

UPSC Hook: boundary between **Europe & Asia**

3. West Siberian Plain

Between Urals and Yenisei River

- One of the **flattest & swampiest plains**
- Extensive **permafrost**
- Poor drainage → marshes
- Rivers: **Ob–Irtysh**



Physiographic Divisions of Russia

Russia's relief can be understood best by a **belt-wise division**, controlled by **latitude, tectonics, and continentality**.

1. East European Plain (Russian Plain)

Western Russia – European part

- One of the **largest plains in the world**
- Gently rolling, fertile, densely populated
- Rivers: **Volga, Dnieper, Don**
- Agricultural & political core (Moscow region)

UPSC Hook: “Breadbasket of Russia”

4. Central Siberian Plateau

Between Yenisei and Lena rivers

- Ancient **shield region**
- Dissected plateau with steep river valleys
- Rich in **coal, nickel, diamonds**
- Rivers deeply entrenched (Yenisei tributaries)

Think: plateau ≠ mountains

5. North Siberian Lowland

Along Arctic coast

- Extremely cold, tundra landscape
- Permanently frozen ground
- Poor soil, negligible agriculture

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6. Eastern Highlands of Siberia

East of Lena River

Includes:

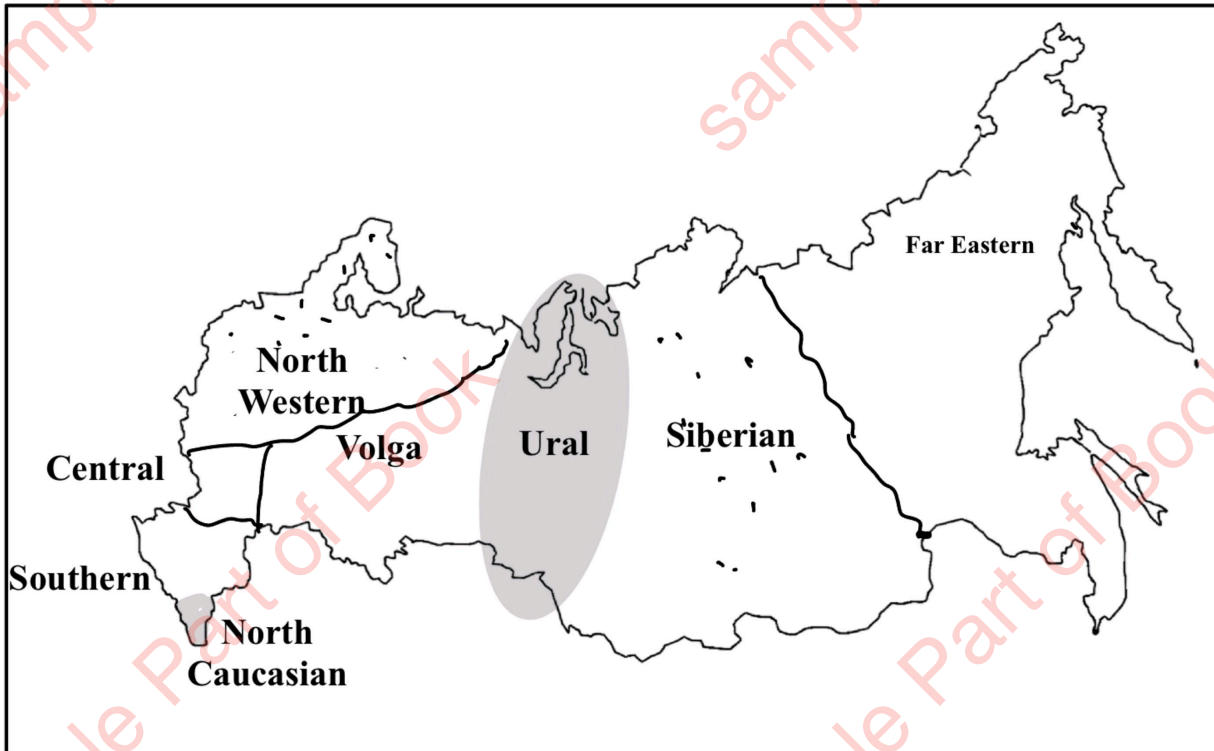
- Verkhoyansk Range
- Chersky Range
- Kolyma Highlands

Characteristics:

- Young fold mountains

- Natural southern boundary

Russia's physiography consists of vast plains in the west and centre, ancient plateaus in central Siberia, and young fold mountains in the south and far east, shaped by latitude, tectonics, and extreme continentality.



- Earthquake-prone
- Source of Kolyma River

Climatically coldest inhabited region

7. Far Eastern Mountains

Pacific margin of Russia

Includes:

- Kamchatka Peninsula
- Koryak Range
- Sikhote-Alin Range

Features:

- Volcanic activity (Ring of Fire)
- Earthquakes
- Narrow coastal plains

UPSC Hook: volcanoes + subduction zone

8. Southern Mountain Systems

Southern border regions

Includes:

- Caucasus Mountains (Mt. Elbrus – highest peak of Europe)
- Altai Mountains
- Sayan Mountains

Characteristics:

- Young fold mountains
- Tectonically active

WATER BODIES OF RUSSIA

OCEANS BORDERING RUSSIA

Arctic Ocean (North)

- Longest Arctic coastline in the world
- Frozen for most of the year
- Strategic for Northern Sea Route

Pacific Ocean (East)

- Seismically active margin
- Rich fisheries
- Linked with Ring of Fire

SEAS OF RUSSIA (VERY IMPORTANT)

Arctic Ocean Seas (West → East)

- Barents Sea
- Kara Sea
- Laptev Sea
- East Siberian Sea
- Chukchi Sea

UPSC Hook: All these are marginal seas of the Arctic Ocean.

Pacific Ocean Seas

- Sea of Okhotsk
- Bering Sea
- Sea of Japan (East Sea)

Sea of Okhotsk is almost enclosed → rich fisheries.

Atlantic-linked Seas (via Europe)

Chapter 8

South-East Asia

South-East Asia is not merely a collection of tropical countries; it is a **geographical transition zone** where **South Asia, East Asia, and the Pacific world intersect**. For UPSC map-based study, the region must be approached as a **spatial system shaped by latitude, tectonics, monsoon dynamics, sea routes, and geopolitics**, rather than as isolated political units.

surrounding seas, ensure high rainfall but also expose the region to **floods, cyclones, and climate-change-induced sea-level rise**.

Strategically, South-East Asia occupies a **critical maritime chokepoint of the world**, hosting the **Strait of Malacca, Sunda Strait, and Lombok Strait**, which link the Indian Ocean with the Pacific Ocean. Consequently, the region holds immense importance in **global trade**,



Latitudinally, South-East Asia lies largely between the **Equator and the Tropic of Cancer**, placing it within the **core monsoon-equatorial climatic belt**. This explains the dominance of **evergreen rainforests, tropical rivers, high biodiversity, and year-round maritime influence**. The equatorial location of Indonesia and Malaysia contrasts with the monsoon-dominated mainland countries such as Myanmar, Thailand, and Vietnam—an essential distinction best understood through maps.

Physiographically, the region is clearly divided into **Mainland South-East Asia** (Indo-China Peninsula) and **Maritime South-East Asia** (island and archipelagic world). This division reflects deeper geological realities: the collision of the **Indian, Eurasian, and Pacific plates**, making South-East Asia one of the world's most **tectonically active zones**, marked

by volcanoes, earthquakes, deep trenches, and island arcs—especially in Indonesia and the Philippines.

From a hydro-climatic perspective, South-East Asia is a **river-civilisation region**, with major rivers like the **Mekong, Irrawaddy, Salween, Red River, and Chao Phraya** shaping settlement, agriculture, and political boundaries. Monsoon winds, coupled with warm

energy security, Indo-Pacific geopolitics, and great-power rivalry, especially involving ASEAN, China, the US, and India.

Therefore, in UPSC preparation, South-East Asia must be studied **map-first**—integrating **location → relief → climate → rivers → resources → sea routes → geopolitics**. Only such a layered cartographic approach allows accurate answering of **Prelims map questions, GS-I analytical answers, and Essay-level geopolitical themes**.

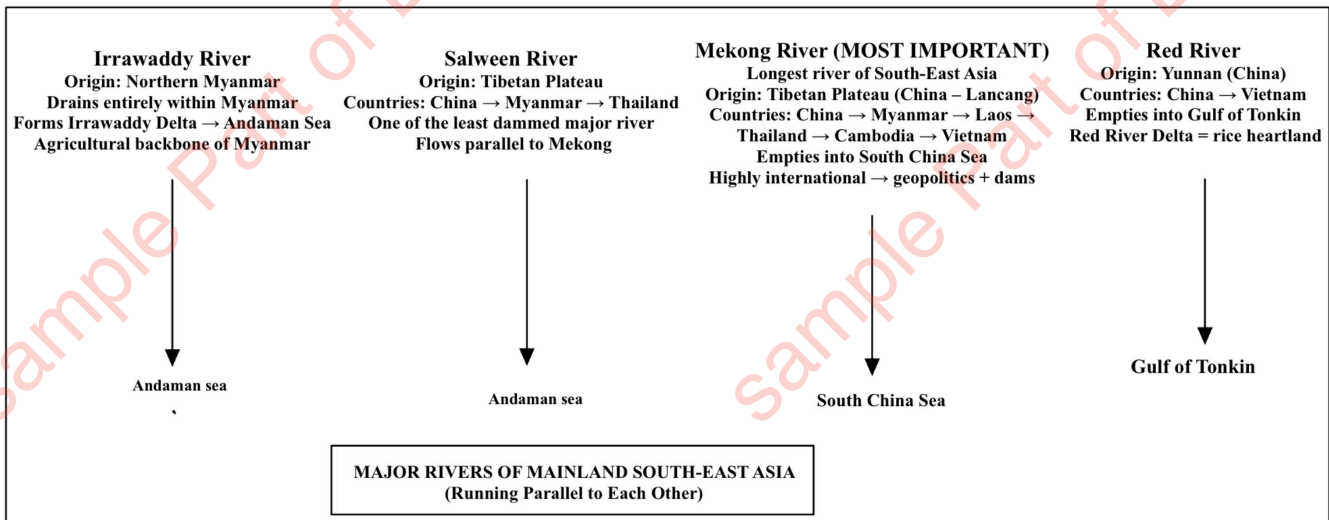
COUNTRIES OF SOUTH-EAST ASIA (11 COUNTRIES)

South-East Asia is divided into **two natural groups**:

1. MAINLAND SOUTH-EAST ASIA (Indo-China Peninsula)

1. **Myanmar**
2. **Thailand**
3. **Laos** (*landlocked*)
4. **Cambodia**
5. **Vietnam**

River-dominated, monsoon climate, Mekong system



PARALLEL RIVER SYSTEM (UPSC FAVOURITE CONCEPT)

From west → east:

Irrawaddy | Salween | Mekong | Red River

Caused by:

- North–South fold mountains
- Youthful relief
- Tectonic control

WATER BODIES OF SOUTH-EAST ASIA 1-OCEANS BORDERING SOUTH-EAST ASIA

Indian Ocean

- Western & south-western margin
- Influences monsoon system
- Linked via Andaman Sea

Pacific Ocean

- Eastern margin
- Strong tectonic & volcanic influence
- Connected via **South China Sea**

SEA lies at the junction of two great oceans → strategic importance

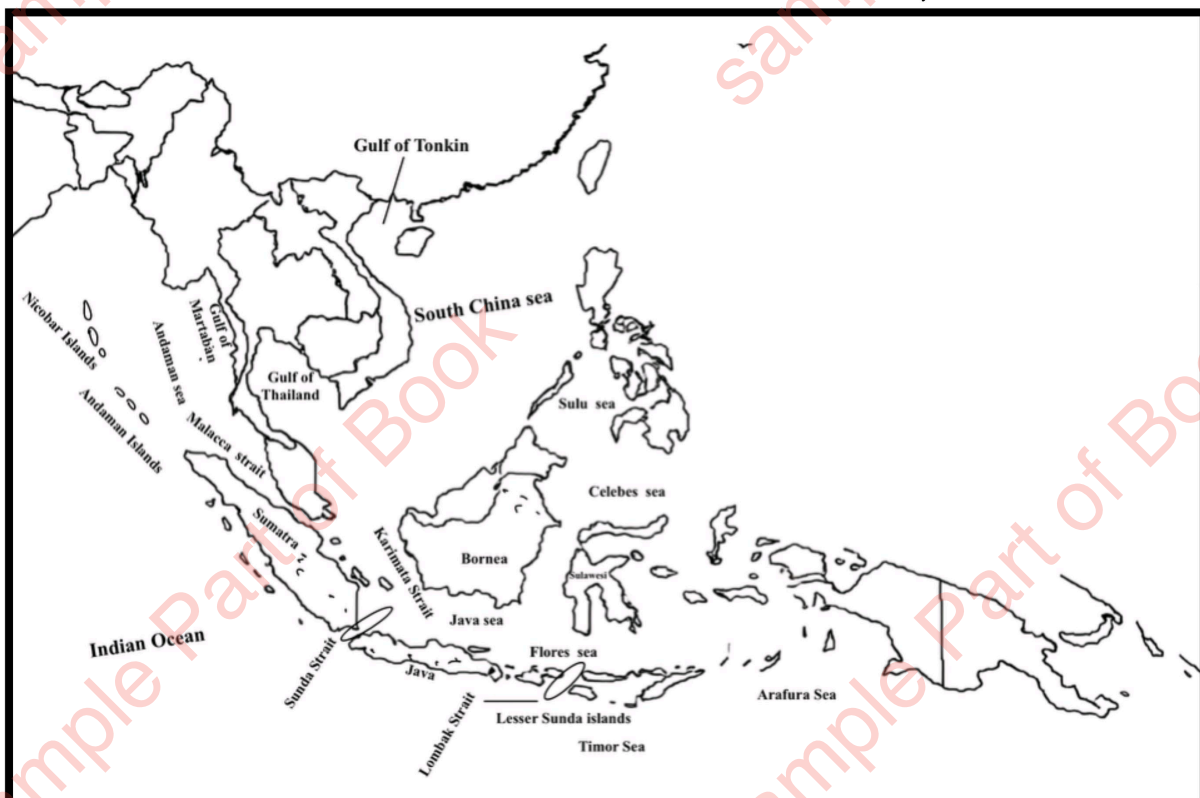
2 - MAJOR SEAS (VERY IMPORTANT)

South China Sea

- Largest & most strategic
- Between China, Vietnam, Philippines, Malaysia, Indonesia
- Disputed waters (Spratly, Parcel)

Andaman Sea

- Eastern arm of Indian Ocean
- West of Myanmar & Thailand



Chapter 10 Australia

Australia is a **continent-country** where **physical geography dominates human geography**, making it exceptionally suitable for **map-based conceptual study rather than rote memorisation**. For UPSC, Australia must be approached as a **closed geographical system**—isolated by oceans, climatically controlled by latitude and currents, and internally structured by relief and aridity.

From a locational perspective, Australia lies largely between **10°S–40°S**, with the **Tropic of Capricorn** passing almost through its centre. This single latitudinal fact explains a chain of outcomes visible clearly on maps: dominance of **subtropical high-pressure belts**, extensive **desert interiors**, and concentration of population along the **eastern and southeastern coastal margins**.

Physiographically, Australia is best understood through a **three-fold map framework**:

1. **Western Plateau** (ancient shield → deserts → minerals),
2. **Central Lowlands** (Murray–Darling basin → agriculture),
3. **Eastern Highlands / Great Dividing Range** (orographic rainfall → rivers → population).

Climatically, Australia is a textbook case where **ocean currents must be mapped** to understand rainfall contrasts:

- **Cold West Australian Current** → aridity of western coast,
 - **Warm East Australian Current + Great Dividing Range** → wetter east coast.
- Thus, climate questions in UPSC can often be answered visually through maps alone.

Ecologically and geopolitically, Australia's isolation has produced **high endemism** (marsupials, monotremes), while its proximity to **Southeast Asia and the Indo-Pacific** gives it growing strategic relevance—especially in questions linking **environment, resources, and geopolitics**.

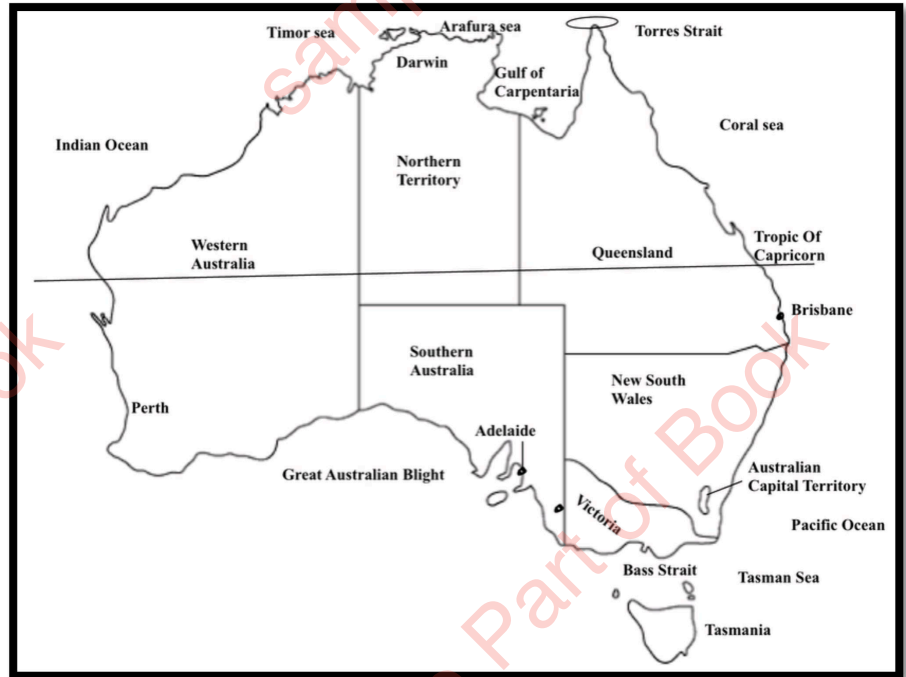
Hence, **mapping Australia is not about listing features, but about tracing cause-effect chains**:

*Latitude → Pressure → Winds → Currents →
Climate → Rivers → Resources → Settlement.*

Political Mapping of Australia

Political mapping of Australia is **comparatively simple but highly scoring**, especially in **Prelims elimination**

questions and **GS-I map marking**. Unlike Asia or Africa, Australia has **fewer political units**, but UPSC tests **precision, coastal association, and capital–state matching**.



Political Map of Australia

Australia is a **federal country** consisting of:

A. Six States

These must be marked with **coast orientation** on the map.

1. **Western Australia (WA)** – entire western half, longest coastline
2. **South Australia (SA)** – central south, no tropical coast
3. **Queensland (QLD)** – northeast coast (tropics + GBR)
4. **New South Wales (NSW)** – southeast coast
5. **Victoria (VIC)** – southernmost mainland state
6. **Tasmania (TAS)** – island state south of mainland

UPSC Hook:

If a state touches **Great Barrier Reef** → **Queensland**

If fully western + mineral rich → **Western Australia**

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B. Two Major Territories

Often confused in map questions.

1. **Northern Territory (NT)**
 - Central north
 - Sparsely populated
 - Tropical–arid transition
2. **Australian Capital Territory (ACT)**
 - Small inland territory
 - Lies **within New South Wales**
 - Contains national capital

Capital Cities

State / Territory	Capital
Western Australia	Perth
South Australia	Adelaide
Queensland	Brisbane
New South Wales	Sydney
Victoria	Melbourne
Tasmania	Hobart
Northern Territory	Darwin
Australian Capital Territory	Canberra

UPSC Hook

Capital not on coast but near it → **Canberra**
Northernmost capital → **Darwin**

C. External Territories

These are **often ignored**, but UPSC loves *one-liner prelim traps*.

- **Christmas Island** – Indian Ocean
- **Cocos (Keeling) Islands** – Indian Ocean
- **Norfolk Island** – Pacific Ocean
- **Australian Antarctic Territory** – Antarctic linkage

Why UPSC cares: Indo-Pacific strategy + Antarctica access.

Australia's political map is simple in form but strict in precision—success lies in coastal orientation, capital location, and state–territory distinction.

Physiographic Study of Australia

The entire continent can be explained through **three major physiographic divisions**, each linked to climate, rivers, resources, and settlement.

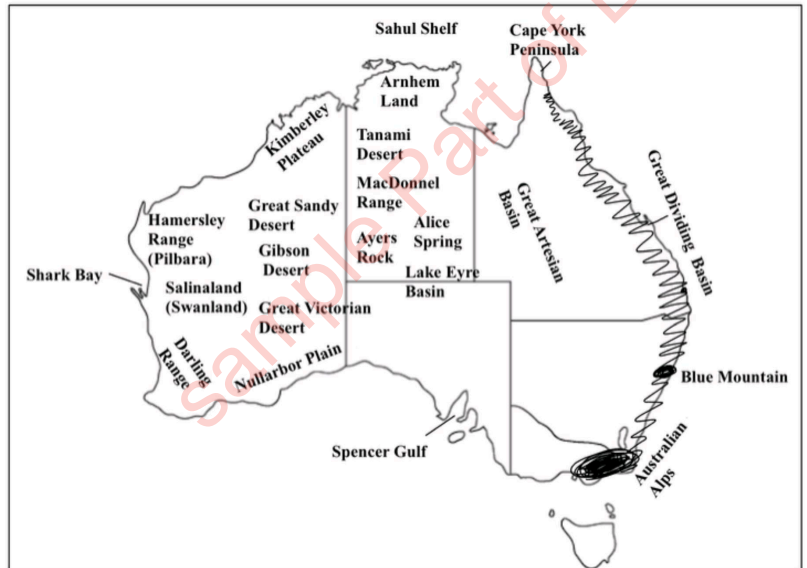
1. Western Plateau (Shield Region)

Location: Occupies nearly **two-thirds** of western Australia

Geological nature: One of the **oldest stable shields** (Precambrian)

Key Physiographic Features

- Vast **tablelands and plateaus**
- Extensive **desert landscapes**
 - Great Victoria Desert
 - Great Sandy Desert
 - Gibson Desert



What is an Inselberg?

- **Inselberg** (German: “island mountain”) = An isolated residual hill rising abruptly from a nearly level plain.

Uluru is a classic inselberg formed by differential erosion in the ancient Western Plateau of Australia.

Nullarbor Plain

It is a vast, flat limestone karst plateau in southern Australia, known for its treeless landscape and underground drainage. It represents one of the world's largest continuous limestone surfaces with extensive cave systems and coastal cliffs.

Key points

- Ancient rocks → **rich mineral resources** (iron ore, gold, bauxite)
- Cold West Australian Current + subtropical high pressure → **aridity**
- Sparse rivers → internal drainage or short seasonal streams

UPSC Hook: If a region is **flat, dry, mineral rich, and sparsely populated** → it belongs to the **Western Plateau**

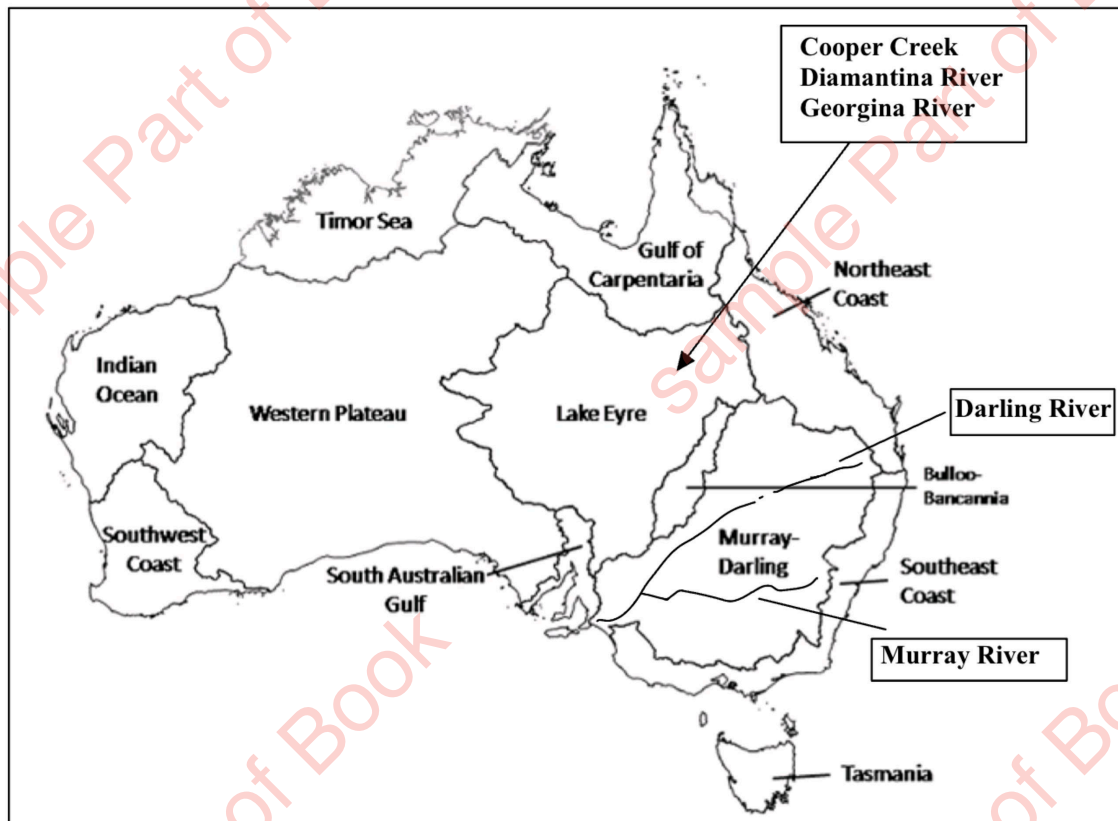
2. Central Lowlands (Interior Basin)

Location: Lies between the Western Plateau and Eastern Highlands

Relief: Lowest and flattest part of Australia

Key Physiographic Features

- **Murray–Darling Basin** (Australia's most important river system)
- **Lake Eyre Basin** (below sea level in places)



- Alluvial plains and sedimentary basins

UPSC Hook

- Gentle slope → long, slow-flowing rivers
- Fertile alluvium → **wheat belt & agriculture**
- Acts as a **transition zone** between desert west and humid east

- Plateau west → deserts → minerals → low population
- Lowlands centre → river basin → farming
- Highlands east → rainfall → rivers → cities

This is why **Sydney, Melbourne, Brisbane** lie close to the eastern highlands, not in the interior.

3. Eastern Highlands / Great Dividing Range

Location: Runs parallel to the **eastern coast**

Extent: From Queensland → New South Wales → Victoria

Key Physiographic Features

- Great Dividing Range (not very high but climatically decisive)
- Australian Alps (highest peak: Mount Kosciuszko)
- Narrow coastal plains on the eastern side

Logic

- Orographic rainfall on eastern slopes
- Source region of short east-flowing rivers
- Supports **dense population, cities, and industries**

UPSC HOOK: Rain + rivers + cities → always trace back to the **Eastern Highlands**

4. Integrated Physiographic Logic

Australia's relief directly controls:

Relief → Climate → Rivers → Vegetation → Settlement

Australia is a plateau continent where ancient relief governs climate, resources, and settlement—making physiography the key to all map-based questions.

Rivers of Australia

Australian rivers are **few, seasonal, and relief-controlled**. Unlike Asia or South America, Australia's drainage system is best understood through **physiography + climate + aridity**, not by memorising river lengths.

1. Overall Drainage Pattern of Australia

Australia has **three distinct drainage systems**, clearly visible on maps:

1. **South-flowing drainage** → Murray–Darling system
2. **Inland (endorheic) drainage** → Lake Eyre basin
3. **Short east-flowing rivers** → Great Dividing Range origin

UPSC Hook: Australia is a land of **inland drainage and seasonal rivers** due to aridity and low relief.

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2. Murray–Darling River System

Location: Southeastern Australia

Drainage type: Exorheic (reaches sea)

Major Rivers

- **Murray River** – *longest river of Australia*
- **Darling River** – main tributary
- **Murrumbidgee, Lachlan** – important tributaries

Significance

- Australia's **largest and most reliable river system**
- Agricultural heartland (wheat, cotton, irrigation)
- Flows through **Central Lowlands**, not desert plateau

UPSC Hook

✗ Darling = longest → *Wrong*

✓ Murray = longest → *Correct*

3. Lake Eyre Basin (Inland Drainage System)

Location: Central Australia

Nature: Endorheic (no outlet to sea)

Major Rivers

- **Cooper Creek**
- **Diamantina River**
- **Georgina River**

Characteristics

- Highly **seasonal and episodic**
- Rivers often disappear due to evaporation
- **Lake Eyre** remains dry most of the year

UPSC HOOK

Interior desert + low slope = inland drainage

4. East-Flowing Rivers (Short but Perennial)

Origin: Eastern Highlands / Great Dividing Range

Rain source: Orographic rainfall + warm East Australian Current

Important Rivers

- **Brisbane River**
- **Burdekin River**
- **Fitzroy River (Queensland)**
- **Hunter River**
- **Clarence River**

Characteristics

- Short length
- Steep gradient
- Comparatively perennial

UPSC Hook: Short river + east coast + rainfall = **Great Dividing Range source**

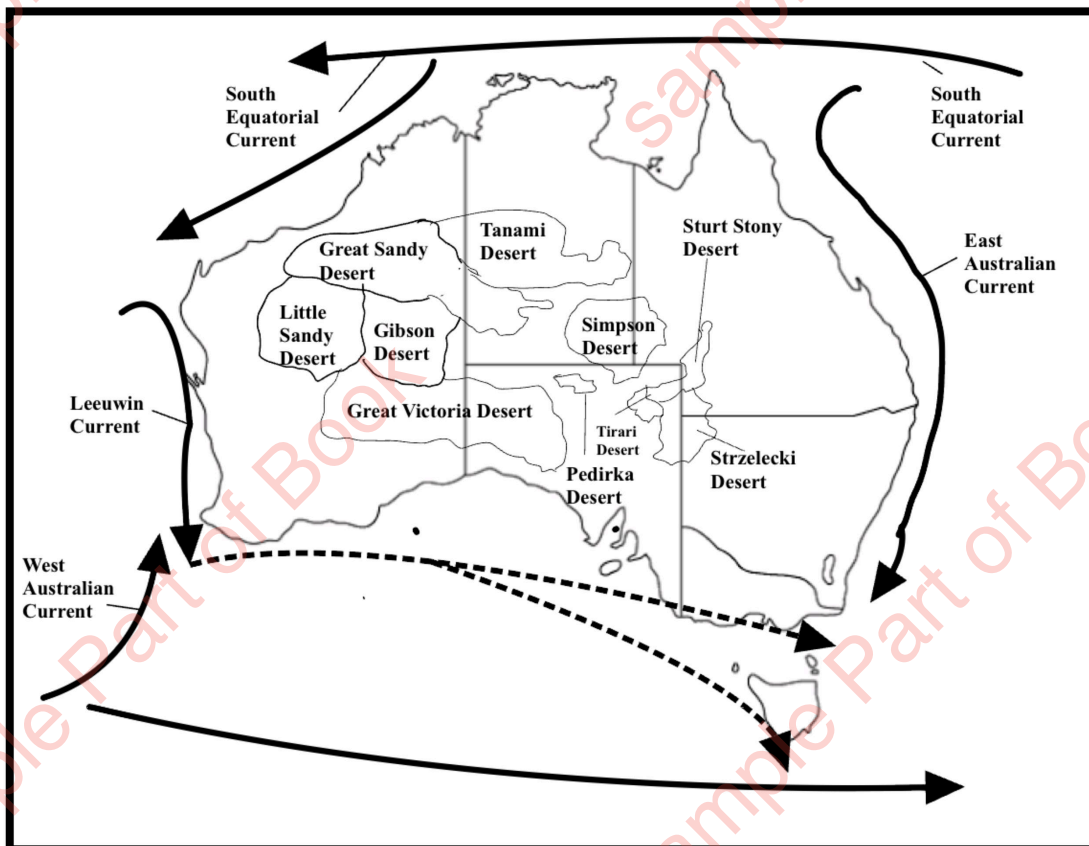
5. West-Flowing Rivers (Very Few & Seasonal)

Western Australia

- Small, short streams
- Mostly seasonal
- Limited by arid climate and cold currents

Australia **lacks major west-flowing rivers**, unlike Africa or South America.

Australian rivers are controlled more by climate and relief than by size—long rivers exist only where low gradient and reliable rainfall coincide.



Ocean Currents of Australia

Ocean currents play a **decisive role** in shaping **Australia's climate, deserts, rainfall distribution, fisheries, and even population pattern**. In fact, many Australian geography questions can be solved simply by mentally overlaying ocean currents on the map.

Major Ocean Currents Affecting Australia

Australia is influenced mainly by **three currents**, two warm and one cold.

A. East Australian Current (Warm)

Location: Flows southward along the **east coast** (Queensland → New South Wales)

Nature: Warm current (Pacific Ocean)

Effects

- Brings warm, moist air to eastern Australia
- Enhances **orographic rainfall** along the Great Dividing Range
- Supports **dense population, agriculture, and forests**
- Feeds warm water towards Tasman Sea

UPSC Hook:

Warm current + east coast + mountains = **high rainfall**

B. Leeuwin Current (Warm but UNIQUE)

Location: Flows southward along the **west coast** and then eastward along the south coast

Nature: Warm current (Indian Ocean)

Why it is special

- One of the **very few warm currents** on a **western continental margin**
- Flows **against prevailing winds**
- **Reason of Mediterranean climate** in Australia

Effects

- Moderates temperatures of western & southern coasts
- Supports marine biodiversity and fisheries
- Prevents extreme coastal desert conditions

UPSC Hook: Leeuwin Current explains

why **western Australia** is not as dry as **Namib or Atacama coasts**

3. West Australian Current (Cold)

Location: Flows northward along the **western coast**

Nature: Cold current

Effects

- Suppresses evaporation
- Creates **stable, dry air**
- Extends aridity inland
- Major reason for **deserts in western & central Australia**

UPSC HOOK:

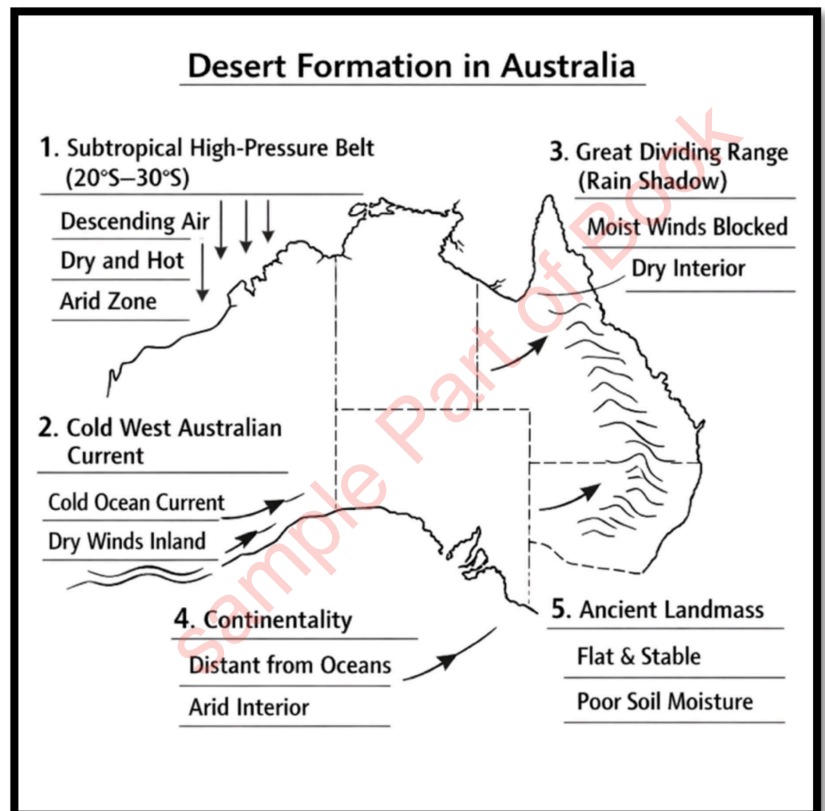
Cold current + west coast = **desert formation**

Australia's climatic contrast—wet east, arid interior, moderated south—is fundamentally a product of interacting warm and cold ocean currents.

Deserts of Australia and Reasons for Their Formation

Australia is often called the **driest inhabited continent**, and this dryness is not accidental. Australian deserts are a **direct outcome of latitude, pressure belts, ocean currents, and relief**, all of which can be clearly demonstrated through maps.

Major Deserts of Australia



These deserts together form a **continuous arid belt** in **western and central Australia**.

Western & Northwestern Australia

- **Great Sandy Desert** – northwest interior
- **Gibson Desert** – central west
- **Great Victoria Desert** – largest desert, south-west interior

Central Australia

- **Simpson Desert** – central east (famous for parallel sand dunes)

Southern Interior (Semi-arid)

- **Tanami Desert** – north-central
- **Sturt Stony Desert** – near Lake Eyre basin

Chapter 12 North America

North America is a continent where **geography operates as a tightly interlinked spatial system rather than a collection of isolated countries**. For UPSC mapping, it must be approached through the logic of **latitude, relief, glaciation, climate, drainage, resources, and geopolitics**, not through rote memorisation of places.

Latitudinally, North America stretches from the **Arctic Circle to the Tropic of Cancer**, covering **polar, temperate, and tropical belts**. This wide latitudinal span explains the presence of **tundra, boreal forests, temperate grasslands, deserts, and tropical rainforests** within a single continent. Mapping latitude belts is therefore the first step to understanding climate zones, vegetation patterns, and human settlement distribution.

Physiographically, the continent shows a **clear east-west structural contrast**. The **young fold mountains of the Rockies and Alaska Range in the west**, the **ancient Canadian Shield in the north-central region**, the **Central Plains**, and the **old Appalachian Mountains in the east** together determine river orientation, mineral concentration, soil fertility, and agricultural regions. Hence, relief mapping forms the backbone of North American map-based answers.

Glaciation is a defining process in North America, especially in **Canada and Alaska**. The legacy of the **Laurentide Ice Sheet** explains the abundance of **lakes, fjords, moraines, thin soils, and irregular drainage**, making glacial landforms a recurring theme in UPSC questions. Mapping lakes, glacial valleys, and permafrost zones becomes essential for understanding ecology, water resources, and climate sensitivity.

Climatically, North America is shaped by the interaction of **latitude, mountain barriers, prevailing westerlies, jet streams, and contrasting ocean currents**. The warm **Gulf Stream** and the cold **Labrador Current**, along with the north-south orientation of mountains, create sharp climatic contrasts between the eastern and western parts of the continent. These patterns directly influence rainfall distribution, extreme weather events, and agricultural belts.



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- **Warm Alaska Current (northwest)** → milder coastal Alaska

Currents explain why eastern USA is wetter than western USA at similar latitudes.

4. Pressure Belts & Winds

- **Westerlies** dominate mid-latitudes
- **Polar easterlies** affect northern Canada
- **Subtropical highs** create deserts in SW USA & N Mexico

II. Major Climate Types of North America

1. Polar & Tundra Climate

Region: Northern Canada, Alaska, Greenland

- Very cold winters
- Permafrost
- Short growing season

2. Subarctic (Taiga) Climate

Region: Southern Canada

- Long cold winters
- Coniferous forests
- Sparse population

3. Humid Continental Climate

Region: NE USA, SE Canada

- Warm summers, cold winters
- High seasonal variation
- Supports dense population & agriculture

4. Marine West Coast Climate

Region: Pacific NW (Canada–USA)

- Mild temperatures
- Heavy rainfall
- Dense forests

5. Mediterranean Climate

Region: California coast

- Dry summers
- Wet winters
- Fruit & horticulture belt

6. Desert & Steppe Climate

Region: SW USA, N Mexico

- Rain shadow + subtropical high
- Low rainfall
- Sparse vegetation

7. Tropical Climate

Region: S Mexico, Central America

- High temperature
- Seasonal rainfall
- Tropical forests & plantations

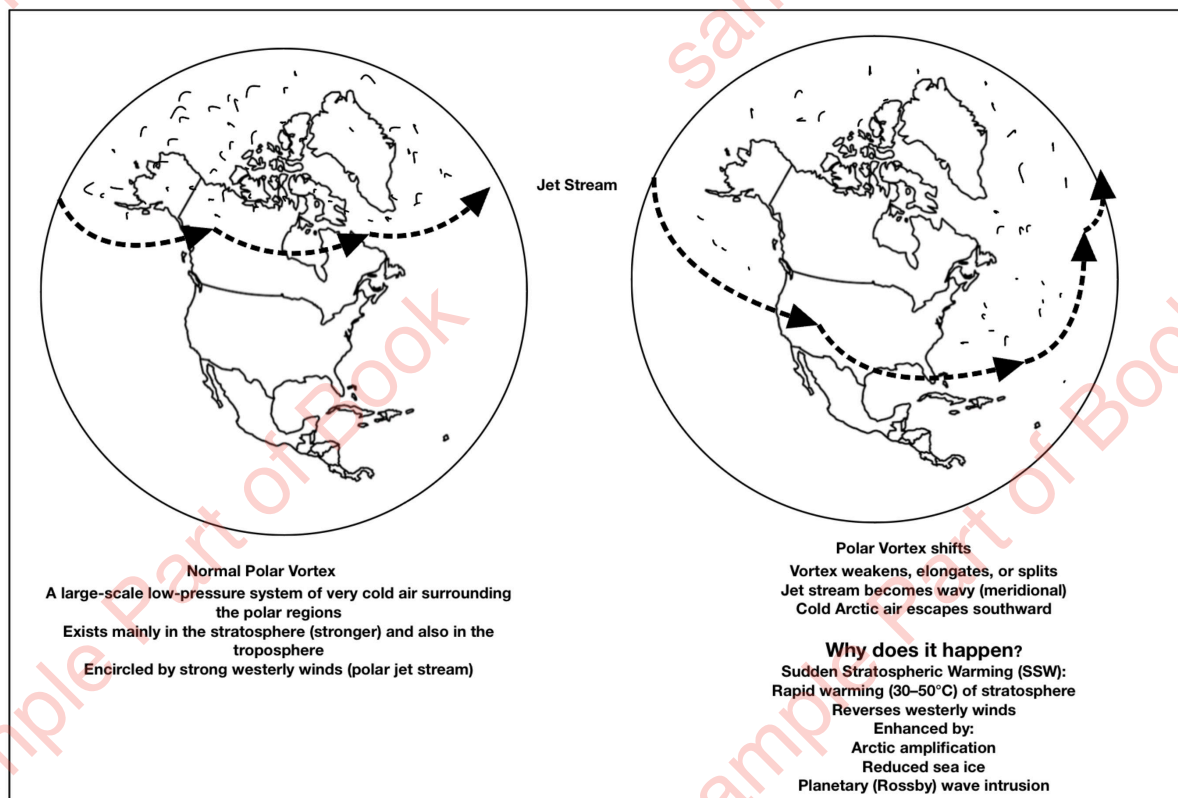
Polar Vortex

What is the Polar Vortex?

The **polar vortex** is a **large, rotating mass of extremely cold air** centered over the **Arctic**, existing **high in the atmosphere (stratosphere)** during winter.

It is **NOT** a storm — it is a **circulation pattern**.

Normal Condition



Chapter 13

Climate of World

Köppen Climate Classification

The **Köppen Climate Classification** is an **empirical climate classification system** developed by **Wladimir Köppen**, which classifies world climates **on the basis of temperature and precipitation** and their **relationship with natural vegetation**.

Core idea: *Climate controls vegetation → vegetation reflects climate*

That's why Köppen is **simple, logical, and widely accepted**.

Köppen used **measurable climatic elements**, not abstract theory:

Temperature thresholds

- Mean monthly temperature
- Warmest & coldest month

Precipitation thresholds

- Total annual rainfall
- Seasonal distribution (summer / winter)

Vegetation correlation

- Each climate type corresponds to a **natural vegetation zone**

Basis of Köppen Classification

Major Köppen Climate Groups (A–E)				
Group	Climate Type	Defining Condition	Subtypes	Key Characteristics / Notes
A	Tropical Climates	Coldest month $\geq 18^{\circ}\text{C}$	Af – Tropical rainforest Am – Tropical monsoon Aw / As – Tropical savanna (wet–dry)	Dominated by ITCZ , strong convective rainfall , high humidity, dense vegetation
B	Dry Climates	Evaporation > Precipitation	BW – Desert • BWh – Hot desert • BWk – Cold desert BS – Steppe (semi-arid)	Defined by aridity , not temperature; sparse vegetation
C	Warm Temperate (Mesothermal)	Coldest month between -3°C and 18°C	Cs – Mediterranean (dry summer) Cfa / Cwa – Humid subtropical Cfb / Cfc – Marine west coast	Moderate temperatures , rainfall throughout the year or seasonally
D	Cool Temperate / Continental (Microthermal)	Coldest month $\leq -3^{\circ}\text{C}$ Warmest month $> 10^{\circ}\text{C}$	Dfa / Dfb – Humid continental Dfc / Dfd – Subarctic / Taiga	Large annual temperature range , severe winters
E	Polar Climates	Warmest month $< 10^{\circ}\text{C}$	ET – Tundra EF – Ice-cap	No trees possible , permanent ice or permafrost

Meaning of Köppen Symbols (Very Important)

1. First Letter → Major climate group

- A, B, C, D, E

2. Second Letter → Rainfall pattern

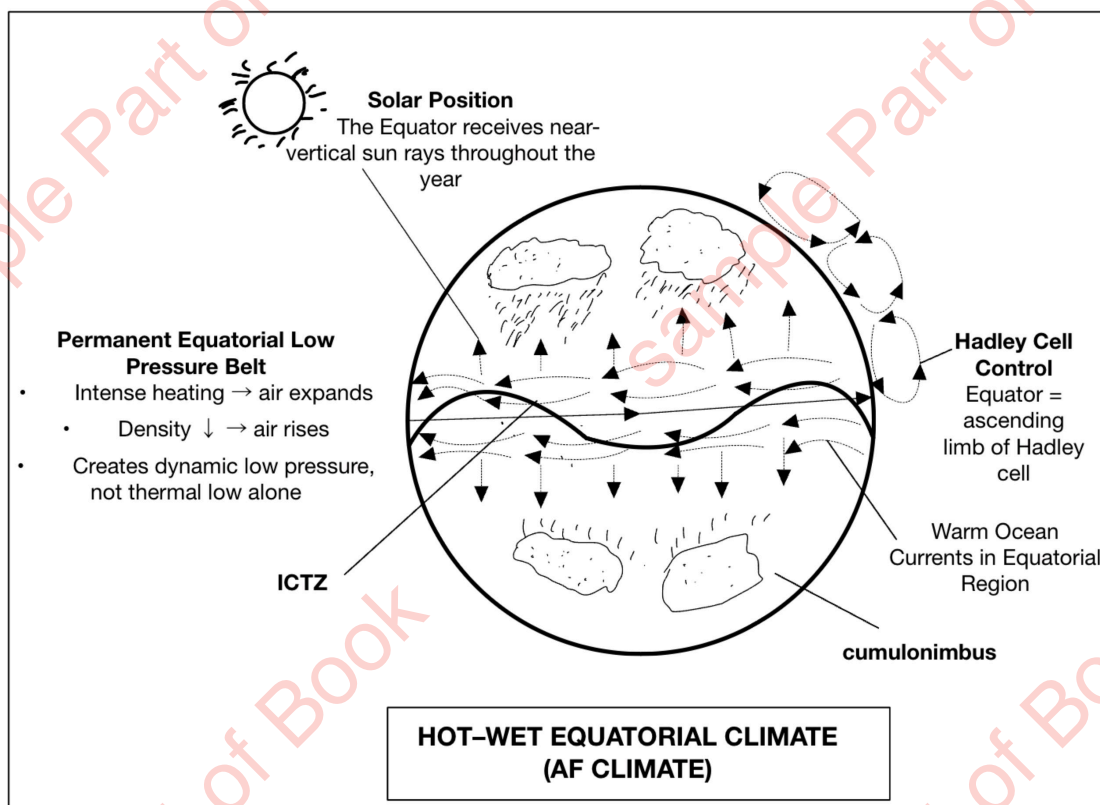
- **f** → no dry season
- **s** → dry summer
- **w** → dry winter
- **m** → monsoon

3. Third Letter → Temperature detail

- **a** → hot summer
- **b** → warm summer
- **c** → cool summer
- **d** → extremely cold winter
- **h** / **k** → hot / cold (dry climates)

Example:

- **Cfa** = Warm temperate + no dry season + hot summer



Examples

Climate Code	Climate Type	Example Region
Af	Tropical rainforest	Amazon
Aw	Savanna	Sudan
BWh	Hot desert	Sahara
Cs	Mediterranean	S. Europe
Cfa	Humid subtropical	E. China
Cfb	Marine west coast	W. Europe
Dfb	Humid continental	E. Europe
Dfc	Taiga	Siberia
ET	Tundra	Arctic coast
EF	Ice cap	Antarctica

Limitations of Köppen

- Ignores:
 - Winds
 - Pressure systems
 - Ocean currents
- Sharp boundaries → reality is transitional
- Human modification not considered

Still, **best base classification**.

Köppen climate classification is an empirical system that categorises world climates into five major groups based on temperature and precipitation thresholds and their relationship with natural vegetation.

HOT-WET EQUATORIAL CLIMATE (AF CLIMATE)

A climate type found near the Equator (5°N–5°S) characterised by:

- Uniformly **high temperature**
- **Very high rainfall throughout the year**
- **High humidity**
- Absence of a dry season

In Köppen classification: **Af Climate**

WHY THE EQUATOR IS CLIMATICALLY UNIQUE

(A) Solar Geometry — the ROOT CAUSE

- The Equator receives **near-vertical sun rays throughout the year**
- Sun angle $\approx 66^\circ$ – 90° annually
- **No seasonal sun shift** like mid-latitudes

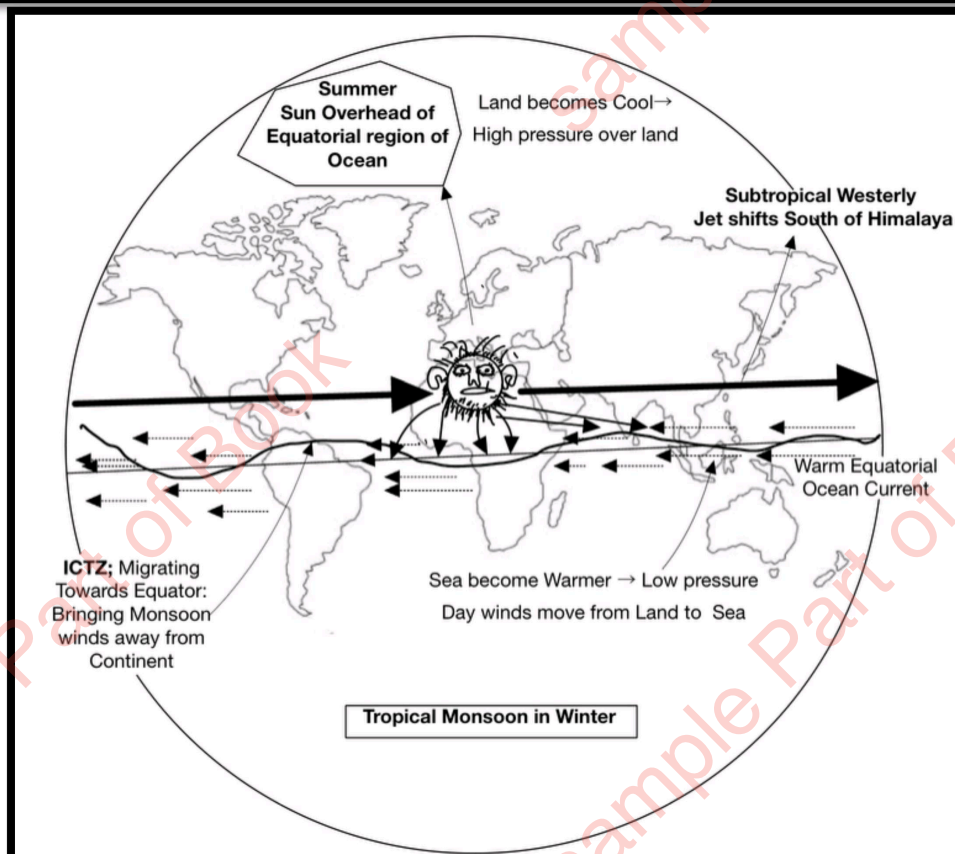
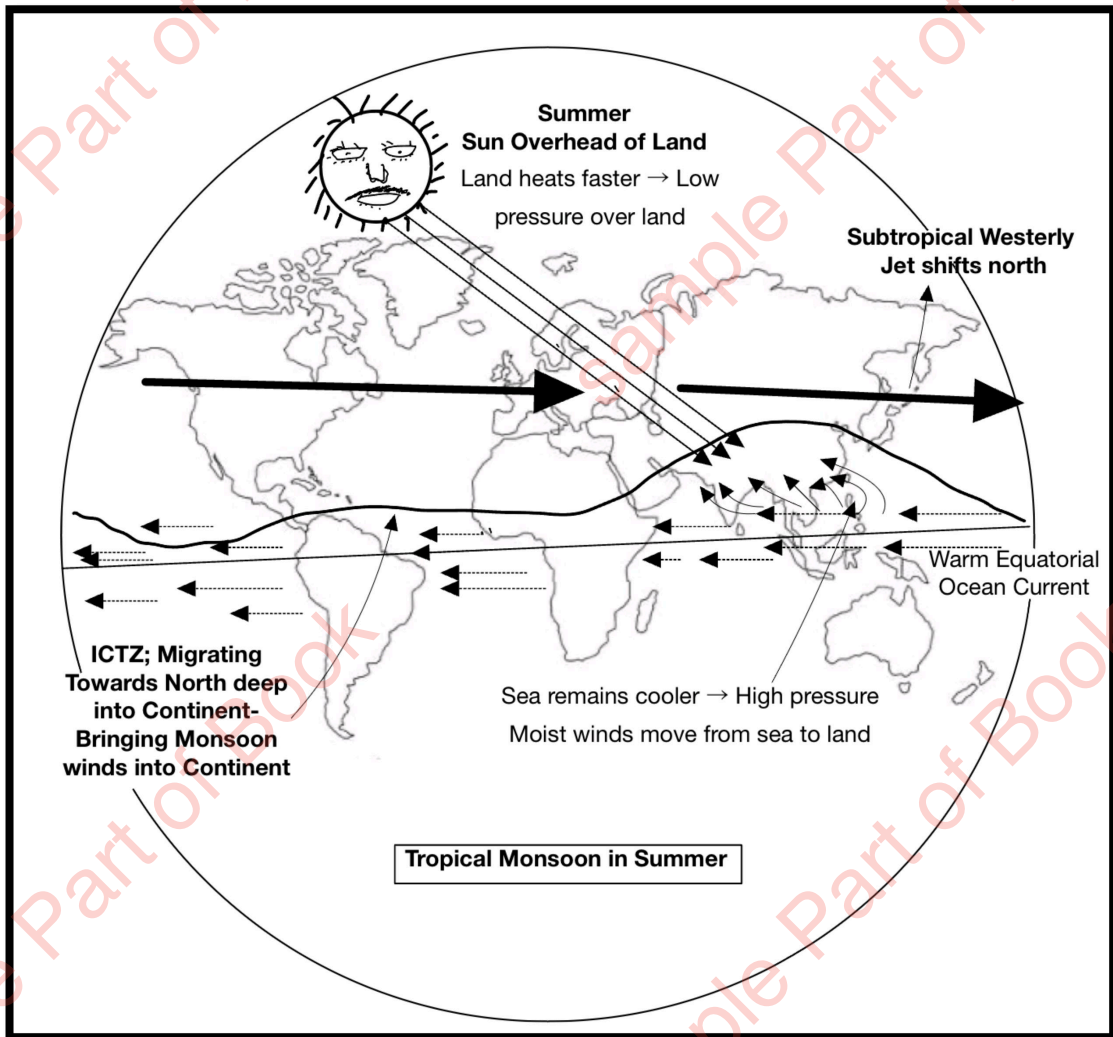
Key implication

Energy input is **constant**, not seasonal

This is why:

- Temperature is **uniform**
- Seasons (summer–winter) are **absent**
- Climate variability is driven by **atmospheric circulation**, not sun angle

UPSC Hook: Equatorial climate is **energy rich but season poor**



Chapter 15

Political Map of India

A **political map** shows **administrative boundaries** and **governance units**, not landforms. So it highlights:

- **International boundary of India**
- **State boundaries and Union Territories**
- **Capitals** (national + state/UT)
- Often: **major cities**, sometimes **district boundaries** (on larger-scale maps)

Survey of India publishes the official “Political Map of India” editions.

India's current administrative structure

India has:

- **28 States**
- **8 Union Territories (UTs)**

Union Territories (UTs) with capitals (very common Prelims area)

Memorise these 8:

1. **Andaman & Nicobar Islands** — Port Blair
2. **Chandigarh** — Chandigarh
3. **Dadra & Nagar Haveli and Daman & Diu** — Daman
4. **Delhi (NCT)** — New Delhi
5. **Jammu & Kashmir** — Srinagar (summer), Jammu (winter)
6. **Ladakh** — Leh
7. **Lakshadweep** — Kavaratti
8. **Puducherry** — Puducherry

UPSC Hook: Some regions have **summer/winter capitals** (e.g. J&K).

States bordering ONE or TWO countries

State	Countries bordered
Punjab	Pakistan
Rajasthan	Pakistan
Gujarat	Pakistan
Uttar Pradesh	Nepal
Bihar	Nepal
Sikkim	Nepal, Bhutan, China
Assam	Bhutan, Bangladesh
Meghalaya	Bangladesh
Tripura	Bangladesh
Mizoram	Bangladesh, Myanmar
Manipur	Myanmar
Nagaland	Myanmar

UPSC Hook

- Afghanistan border is **only via J&K/UTs**.
- Bhutan borders **only NE states** (not plains).

States bordering **THREE** countries (Very high value)

State	Countries bordered
West Bengal	Bangladesh, Nepal, Bhutan
Arunachal Pradesh	China, Bhutan, Myanmar
Sikkim	Nepal, Bhutan, China

UPSC Hook: Sikkim is the **ONLY** Indian state touching all three Himalayan neighbours.

Border Lengths

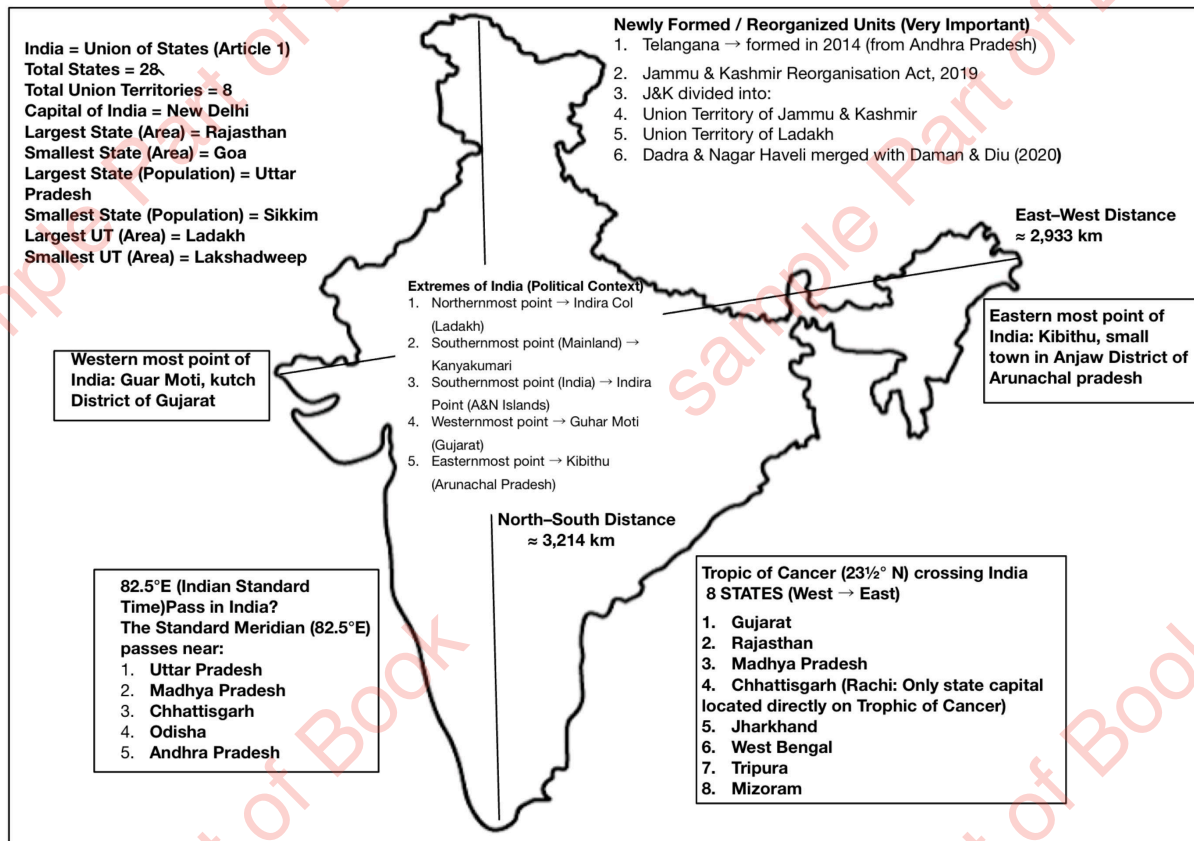
Border with	Approx. length
Bangladesh	~4,096 km (Longest)
China	~3,488 km
Pakistan	~3,323 km
Myanmar	~1,643 km
Nepal	~1,751 km
Bhutan	~699 km

High-border states (rank sense)

Rank	State	Countries bordered	Approx. border length
1	West Bengal	Bangladesh	~2,216 km
2	Arunachal Pradesh	China, Bhutan, Myanmar	~1,080 km
3	Rajasthan	Pakistan	~1,070 km
4	Assam	Bangladesh, Bhutan	~1,050 km
5	Meghalaya	Bangladesh	~443 km
6	Tripura	Bangladesh	~856 km

Revision Box

- Longest international border (India) → Bangladesh
- State with longest international border → West Bengal
- Largest state bordering another country → Rajasthan.
- State bordering maximum countries → Arunachal Pradesh (3)
- Longest China border state → Arunachal Pradesh
- Longest Pakistan border state → Rajasthan



Coastal States vs Landlocked States

Coastal States (9)

Western Coast	Eastern Coast
Gujarat	West Bengal
Maharashtra	Odisha
Goa	Andhra Pradesh
Karnataka	Tamil Nadu
Kerala	

Prelims certainty

9 coastal states + 2 coastal UTs (not states)

Landlocked States (19)

Category	States
Northern plains	Punjab, Haryana, UP, Bihar
Central India	MP, Chhattisgarh
Deccan interior	Telangana
NE (mostly landlocked)	Assam, Manipur, Mizoram, Nagaland, Tripura
Himalayan	Himachal Pradesh, Uttarakhand, Sikkim
Others	Jharkhand

UPSC Hook

- West Bengal is coastal (many forget).
- Assam is landlocked despite Brahmaputra.

Physiographic Location of States

Himalayan Belt States

Western Himalaya	Eastern Himalaya
Himachal Pradesh	Sikkim
Uttarakhand	Arunachal Pradesh

Note

- J&K & Ladakh are UTs, hence excluded here.

North-Eastern States (8)

Mnemonic: "Seven Sisters + Sikkim"

States
Assam
Arunachal Pradesh
Manipur
Meghalaya
Mizoram
Nagaland
Tripura
Sikkim

Peninsular India States

Western Ghats	Deccan Plateau	Eastern Ghats
Gujarat	Maharashtra	Odisha
Maharashtra	Telangana	Andhra Pradesh
Goa	Karnataka	Tamil Nadu
Karnataka	Chhattisgarh	
Kerala	Jharkhand	
	Madhya Pradesh	

Peninsular India = old crystalline shield, tectonically stable.

Island Regions (NOT states)

No Indian STATE is an island

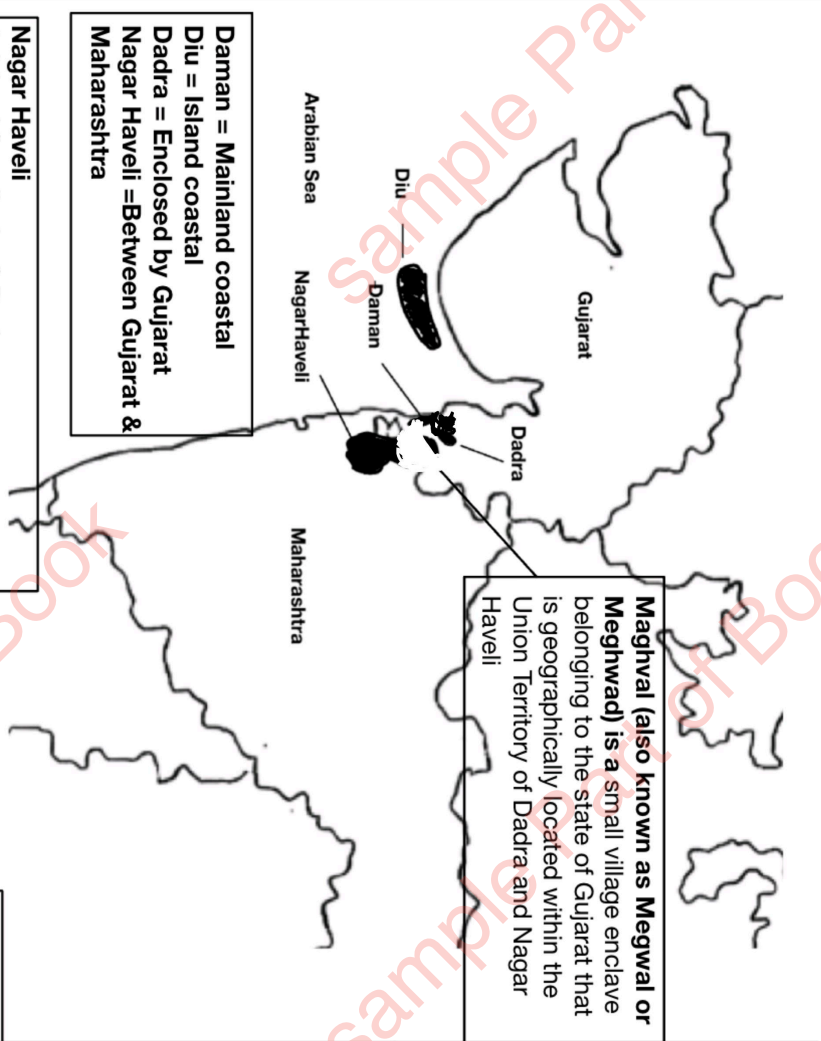
Island Groups	Status
Andaman & Nicobar Islands	UT
Lakshadweep	UT

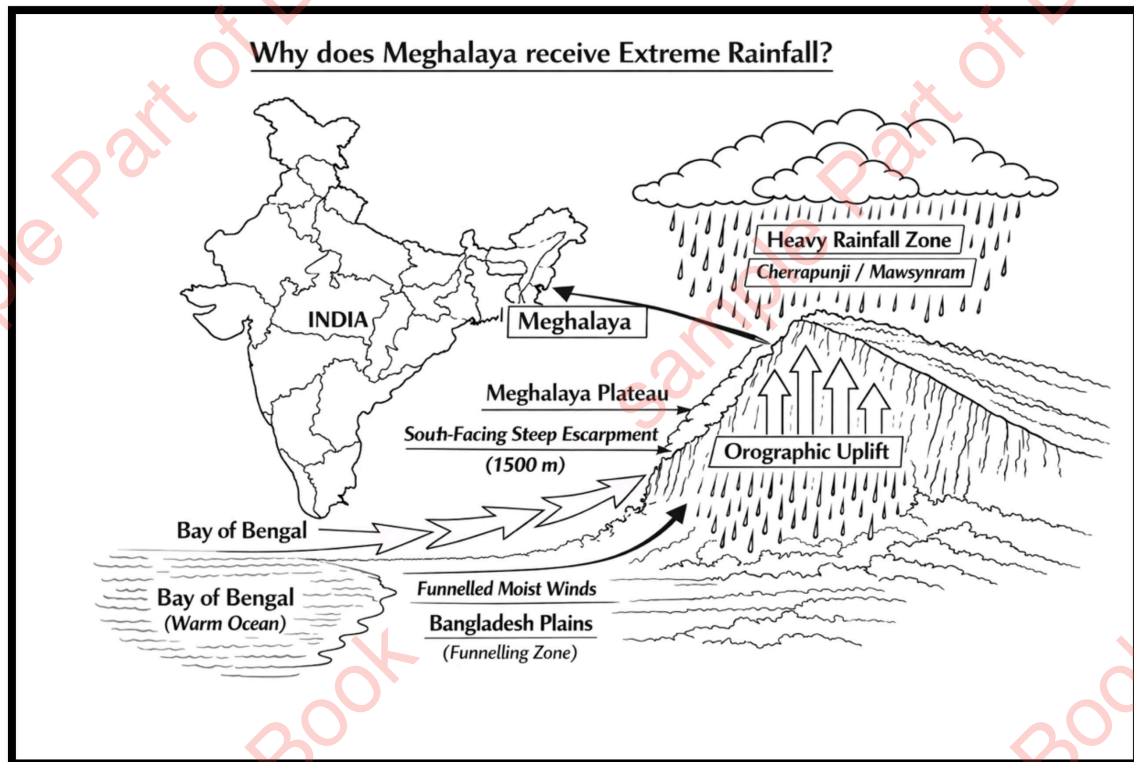
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Southernmost island: Minicoy

Minicoy culturally closer to Maldives

Lighthouse on Minicoy is important maritime landmark

 Meghwal (also known as Meghwal or Meghwal) is a small village enclave belonging to the state of Gujarat that is geographically located within the Union Territory of Dadra and Nagar Haveli	Daman 1. Located on the Arabian Sea coast 2. Completely enclosed by Gujarat 3. River Mouth Location 4. Two Divisions 5. Colonial & Coastal Significance Situated at the mouth of Daman Ganga River River divides Daman into two parts Moti Daman (administrative/fort area) Nani Daman (commercial area) Former Portuguese colony (till 1961) Small but strategically located coastal UT
Daman = Mainland coastal Diu = Island coastal Dadra = Enclosed by Gujarat Nagar Haveli = Between Gujarat & Maharashtra	Diu 1. Diu is a small island off the Gujarat coast. 2. Surrounding Water Body 3. Enclosed by Gujarat Located near the Kathiawar (Saurashtra) Peninsula. Bordered by the Arabian Sea. Separated from mainland Gujarat by a narrow creek. Land connection via bridge to Gujarat (Gir Somnath district).
Nagar Haveli 1. Inland (Landlocked) Region 2. Between Two States 3. Capital 4. River System 5. Physical Features Does not touch the sea. Lies between Gujarat (north) and Maharashtra (south). Not fully surrounded by one state (unlike Dadra). Silvassa is the capital town. Located in the basin of Daman Ganga River. River flows westward to Daman (Arabian Sea). Part of the Western Ghats foothill region.	Dadra 1. Dadra is a small enclave surrounded by Gujarat. 2. It does not lie inside Maharashtra. 3. It is separated from the main Nagar Haveli region. 4. It is part of the Union Territory Dadra and Nagar Haveli and Daman and Diu. 5. It lies near the Gujarat–Maharashtra border but is enclosed by Gujarat territory.



Garo Hills (West)

- Lower elevation
- Dense forests
- Gentler slopes

Khasi Hills (Central)

- Highest and most dissected
- **Shillong Peak** (~1961 m)
- Contains:
 - Cherrapunji
 - Mawsynram (world's highest rainfall)

Jaintia Hills (East)

- Rich in limestone & coal
- Extensive cave systems

4. Relief & Surface Features

- Average height: **1000–1500 m**
- **Steep southern escarpment** facing Bangladesh
- Gentle northern slope towards Brahmaputra valley

Geomorphic feature

- Classic **tilted plateau**
- South-facing scarp → heavy rainfall

5. Drainage System

Rivers are short, swift, and deeply incised.

South-flowing (into Bangladesh)

- Umngot
- Myntdu
- Simsang

North-flowing (into Brahmaputra)

- Kopili
- Uiam

Due to steep gradient → **waterfalls, gorges**

6. Karst Topography & Caves (Unique Feature)

- Abundant **limestone**
- High rainfall + CO₂-rich water → chemical weathering

Landforms:

- Caves
- Sinkholes
- Underground rivers

UPSC Hooks: Meghalaya has one of the longest cave systems in South Asia.

7. Soils, Vegetation & Biodiversity

Soils:

- Red and lateritic
- Highly leached

Vegetation:

- Tropical evergreen forests
- Sacred groves (Khasi tradition)

Biodiversity:

- High endemism
- Part of Indo-Burma biodiversity hotspot

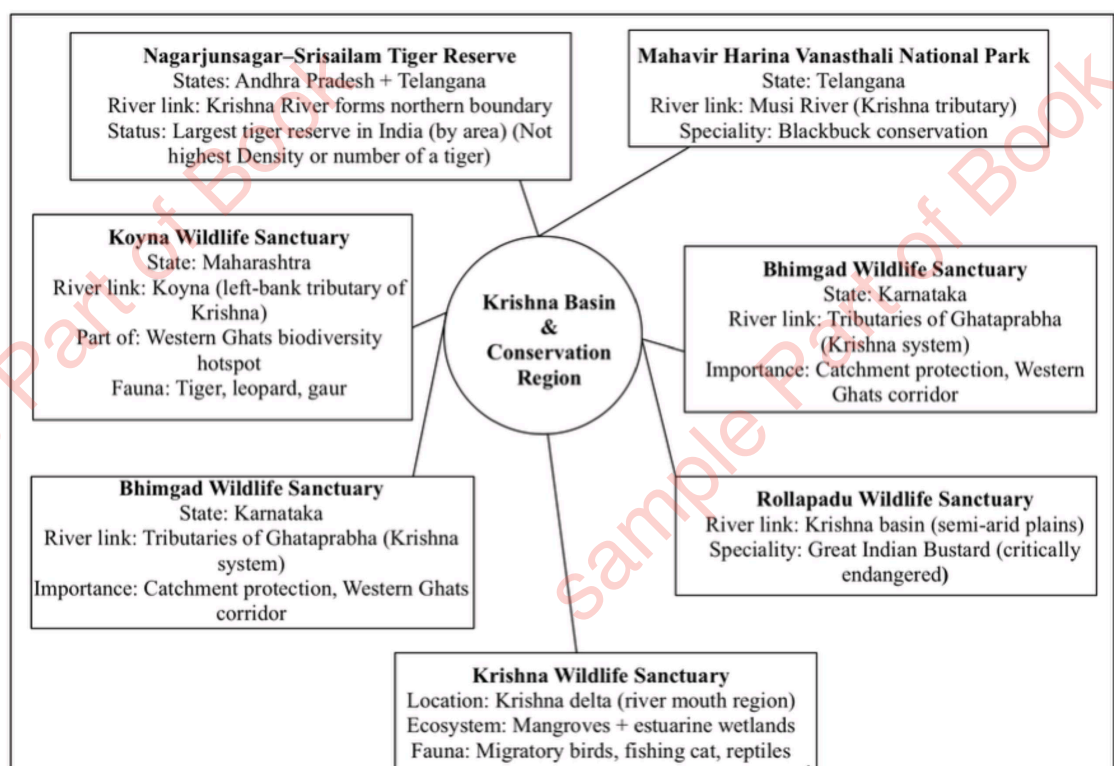
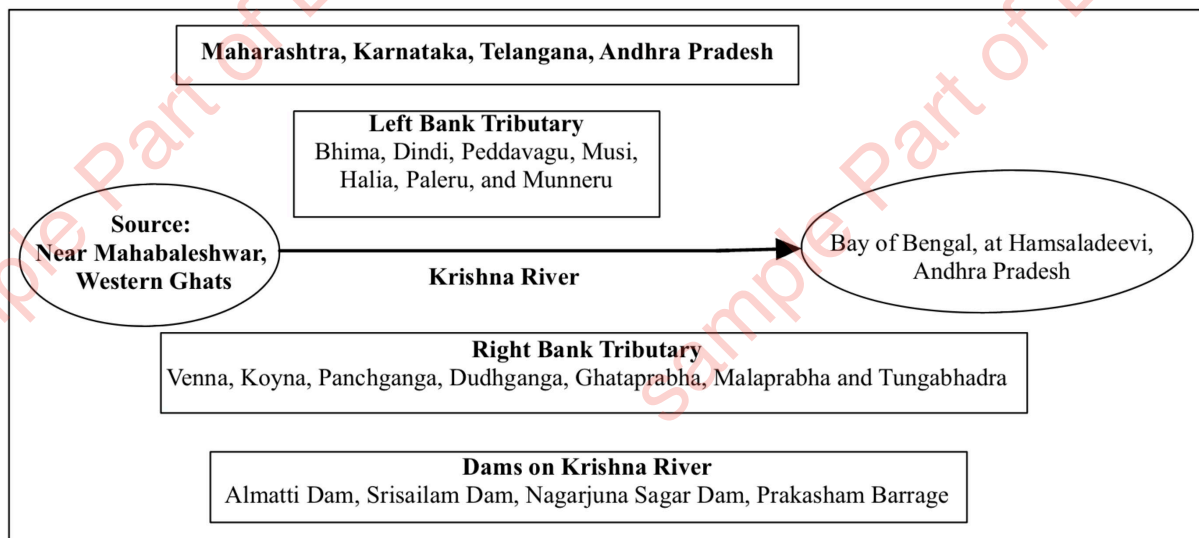
8. Human Geography & Economy

Population:

- Predominantly tribal
 - Khasi
 - Garo
 - Jaintia

Economic activities:

- Coal mining (rat-hole mining – controversial)
- Limestone quarrying
- Agriculture (shifting cultivation)



Munneru River

Key features

Origin: Telangana plateau
Nature: Seasonal to semi-perennial
Flood relevance: Causes flooding in low-lying plains
Role: Major drainage line of central Telangana

UPSC **Hook:** Flooding + drainage management in Krishna basin

Role: Local irrigation and drainage in western Maharashtra

Small but true left-bank tributary

Koyna River

Bank: Right-bank

Key features

Origin: Western Ghats near Mahabaleshwar
Nature: Perennial, heavy monsoon discharge
Major project: **Koyna Hydroelectric Project** (largest completed hydel project in India)
Ecological zone: Western Ghats biodiversity hotspot
Important for hydropower, not irrigation

Panchganga River

Bank: Left-bank

B. Right Bank Tributaries (North of main river)

Venna River

Bank: Left-bank

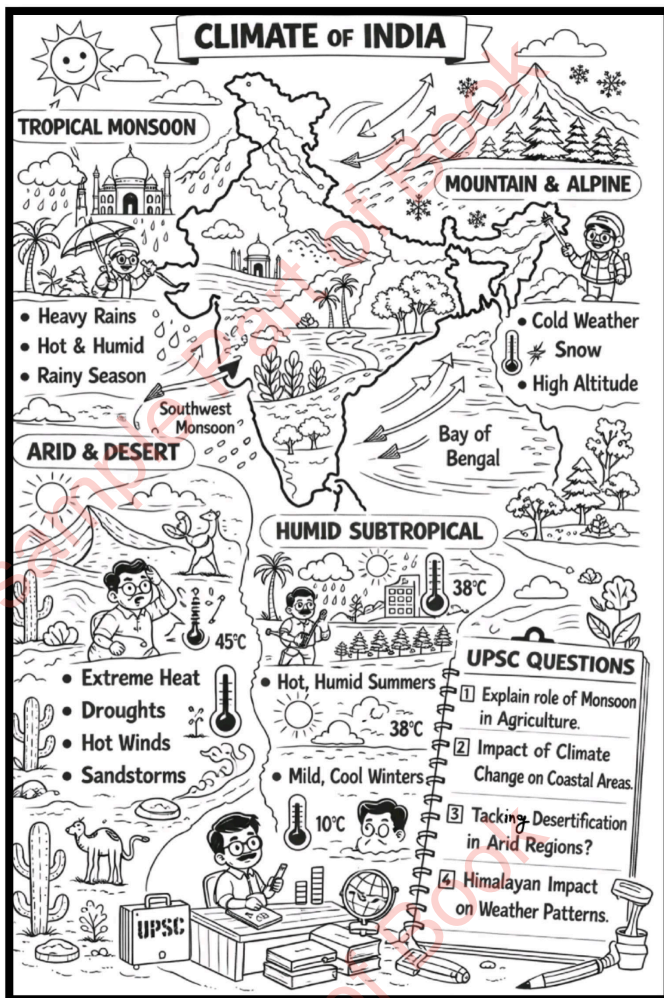
Key features

Origin: Satara region, Maharashtra
Nature: Seasonal, rain-fed
Joins Krishna upstream of Panchganga confluence

Chapter 18

Climate Of India

India has a **tropical monsoon type of climate**, primarily governed by seasonal reversal of winds due to differential heating of land and sea. Its climate is shaped by latitudinal extent, Himalayan barrier, peninsular location, and large-scale atmospheric systems like monsoon winds, subtropical westerlies, and tropical cyclones. As a result, India experiences marked seasonal variations—summer, southwest monsoon, retreating monsoon, and winter—leading to wide spatial and temporal diversity in temperature and rainfall.



Winter Monsoon

Factors Affecting Winter Monsoon in India (Oct–Dec)

1. Seasonal Shift of Pressure Belts (ITCZ Migration)

During winter, the **Inter-Tropical Convergence Zone (ITCZ)** shifts south of the Equator. This leads to the establishment of **high pressure over the**

Indian subcontinent and **low pressure over the Indian Ocean**.

As a result, winds reverse direction and blow **from land to sea**.

This reversal is the fundamental cause of the winter monsoon.

2. Development of Continental High Pressure over North India

Intense cooling of landmass in winter creates a **strong high-pressure cell over NW & Central India**.

Cold, dry air flows outward from this high-pressure zone.

These winds are:

Dry over most of India

Moisture-deficient initially

3. Direction of Winds: Northeast Trade Winds

Winds blow as **Northeast Monsoon winds** (NE → SW).

Over land → **dry conditions** in most of India.

Over Bay of Bengal → winds pick up moisture.

Hence:

Tamil Nadu & SE coast get rain

Rest of India remains dry

4. Role of Bay of Bengal (Moisture Source)

When NE monsoon winds cross the **Bay of Bengal**, they absorb moisture.

On reaching the **Coromandel Coast**, they cause rainfall.

This explains:

Tamil Nadu receives **40–60% of annual rainfall** in winter.

Andhra Pradesh & SE Karnataka also get some rain.

5. Cyclonic Depressions & Tropical Cyclones (Very Important)

Winter is peak season for **cyclonic disturbances in the Bay of Bengal**.

These systems intensify rainfall over:

Tamil Nadu

Coastal Andhra Pradesh

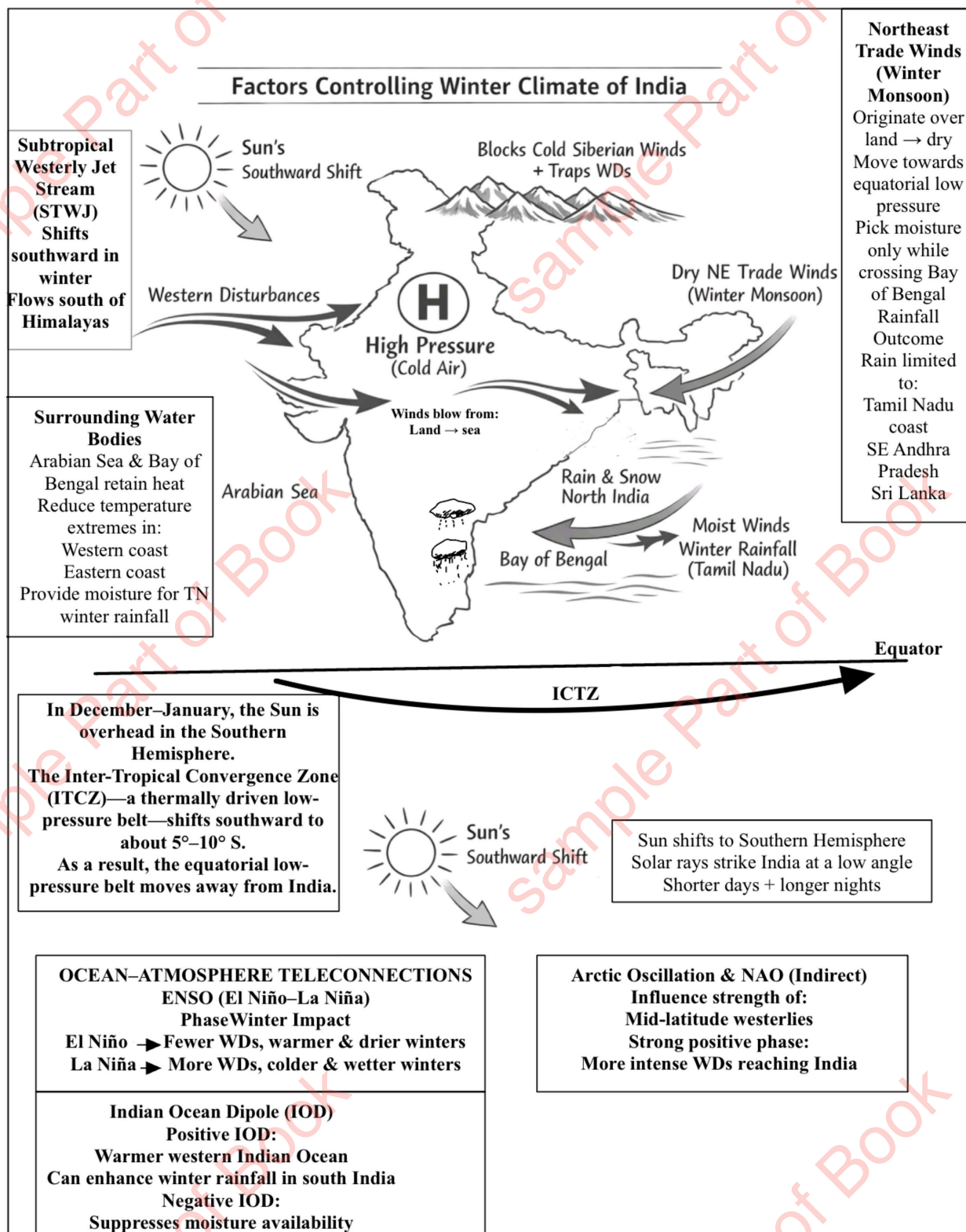
Puducherry

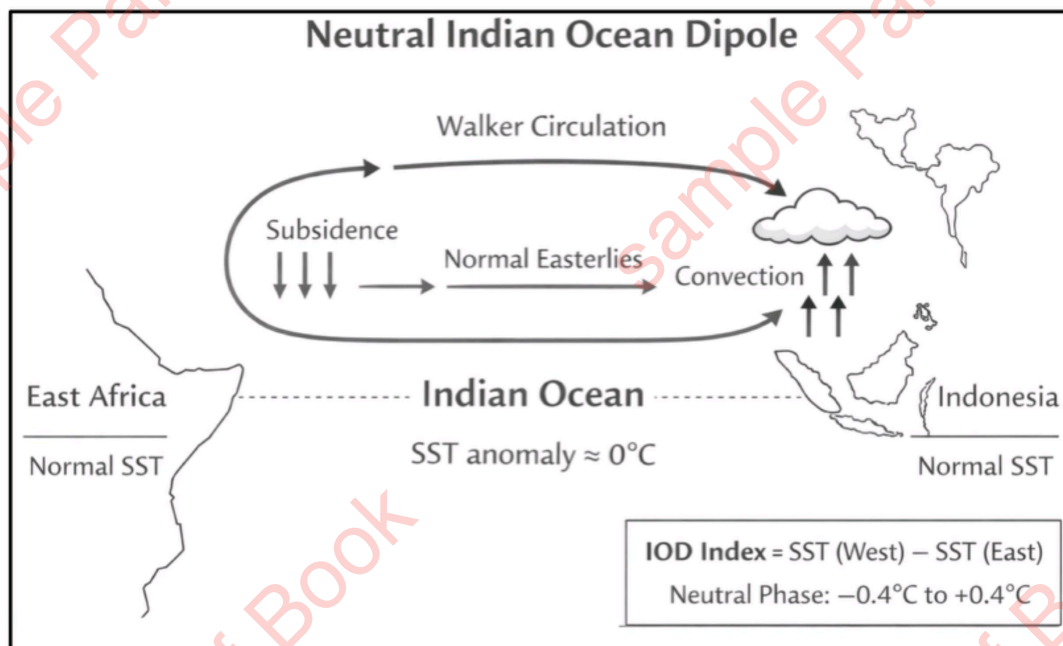
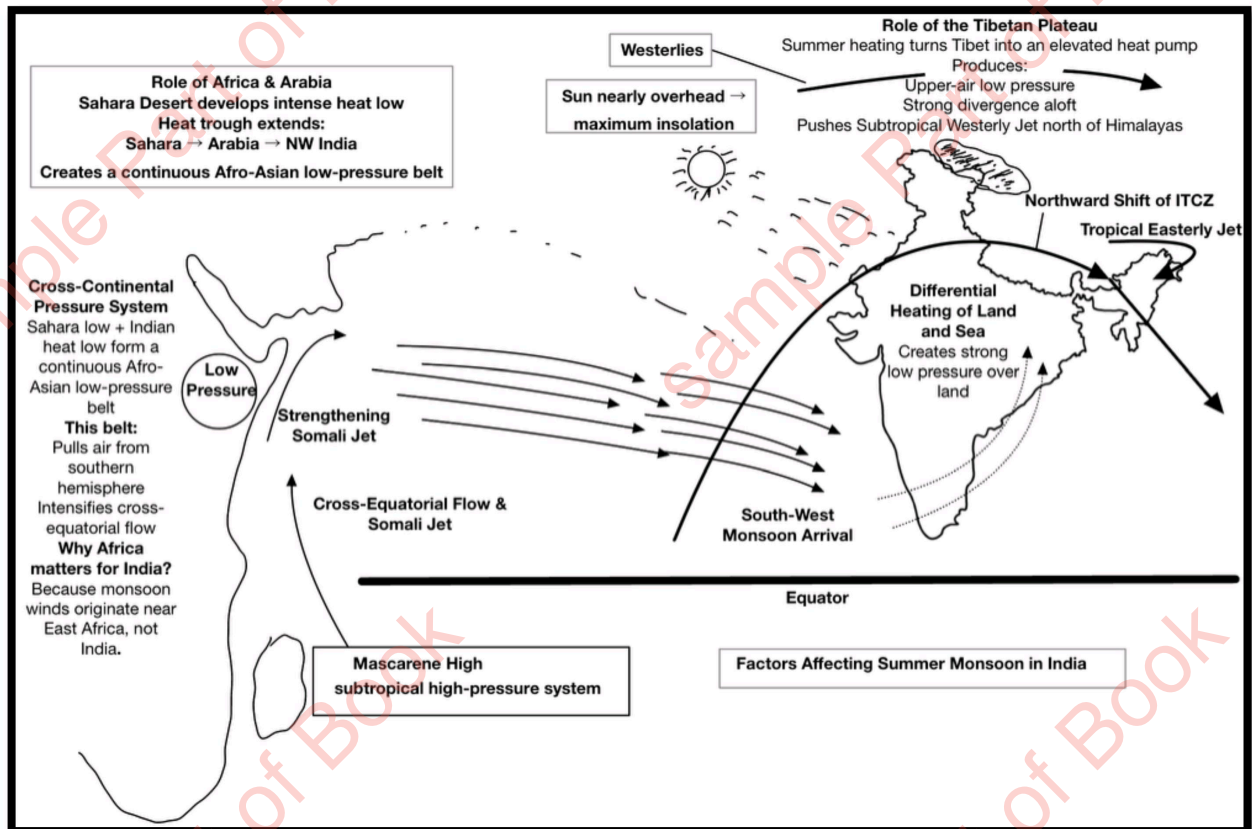
Often responsible for **heavy floods** in SE India.

6. Western Disturbances (Indirect Influence)

Western Disturbances originate from the **Mediterranean region**.

They bring:



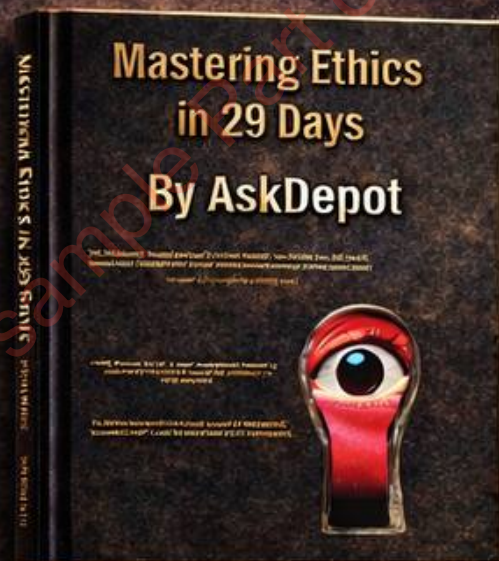
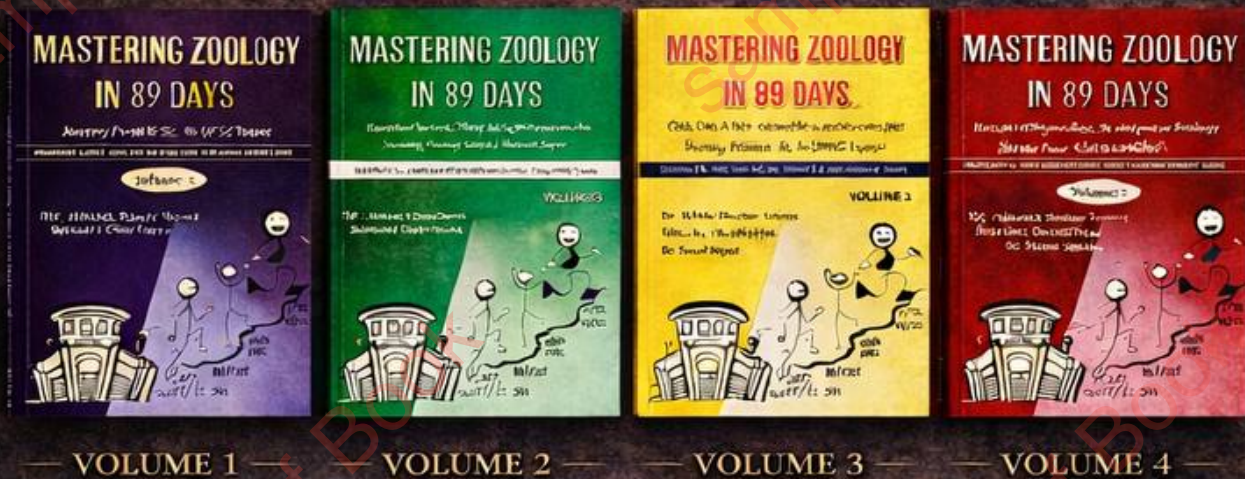


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