APPSC GROUP 1

GEOGRAPHY

Published visual collection

Updated through Day 32

45 topics | 421 teaching panels

Day-wise topic index with clickable links and PDF bookmarks.

Approved teaching artwork is preserved without redesign.

One current index replaces the earlier stacked historical indexes.

No lesson notes or practice questions are included.

Updated 14 November 2026

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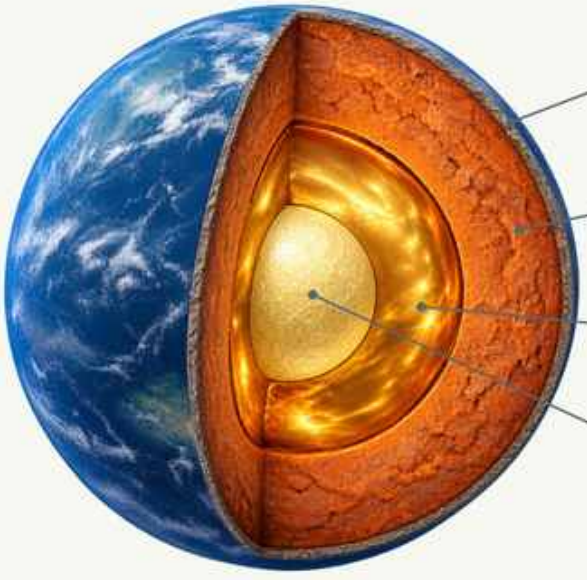
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APPSC 1000 • DAY 1
TOPIC 06 • ENGLISH

Inside the Earth

Layer • physical state • boundary



CRUST
Thin, brittle solid rock

MANTLE
Mostly solid rock

OUTER CORE
Liquid metal

INNER CORE
Solid metal

BOUNDARIES TO REMEMBER

MOHO	Crust ↔ mantle
GUTENBERG	Mantle ↔ outer core • about 2,900 km
INNER-CORE BOUNDARY	Outer ↔ inner core • about 5,150 km

MATERIAL LAYERS ≠ MECHANICAL LAYERS

Crust
Rigid uppermost mantle
Weaker asthenosphere below

Lithosphere = both together

EXAM CLUE
S-waves do not pass through the liquid outer core.

References: Source Index
Depths approximate; layer proportions in the illustration are not to scale

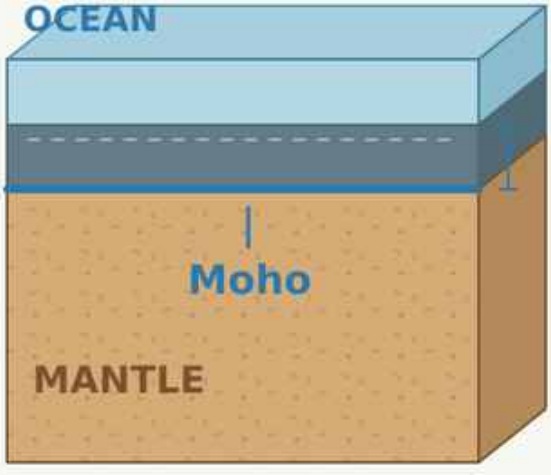
FREE LEARNING INITIATIVE

Day 1 · Topic 6 · Geography D-1

The crust has two very different faces

The Moho is deeper beneath continents

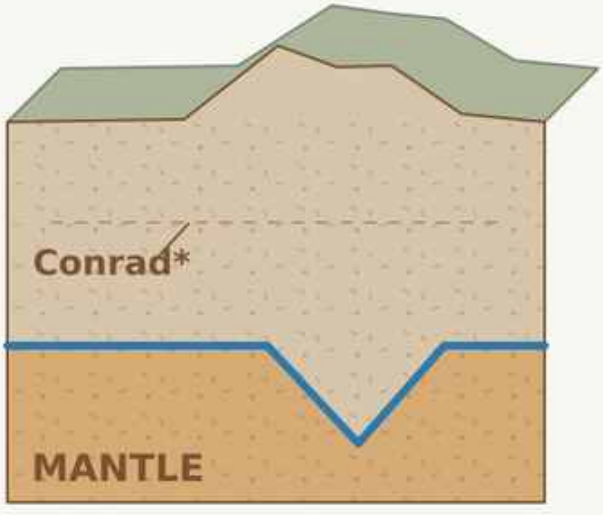
OCEANIC CRUST



5 km mean

Basalt + gabbro
Thinner, but denser

CONTINENTAL CRUST



≈30 km mean

Granite-type rocks
Thicker, but lighter

Himalayan crust: up to 70 km

SIMA

Silica + magnesia
Older exam term

SIAL

Silica + alumina
Older exam term

*Variable boundary within continental crust; absent in some regions.

References: Source Index
Physical cross-sections are schematic, not to scale

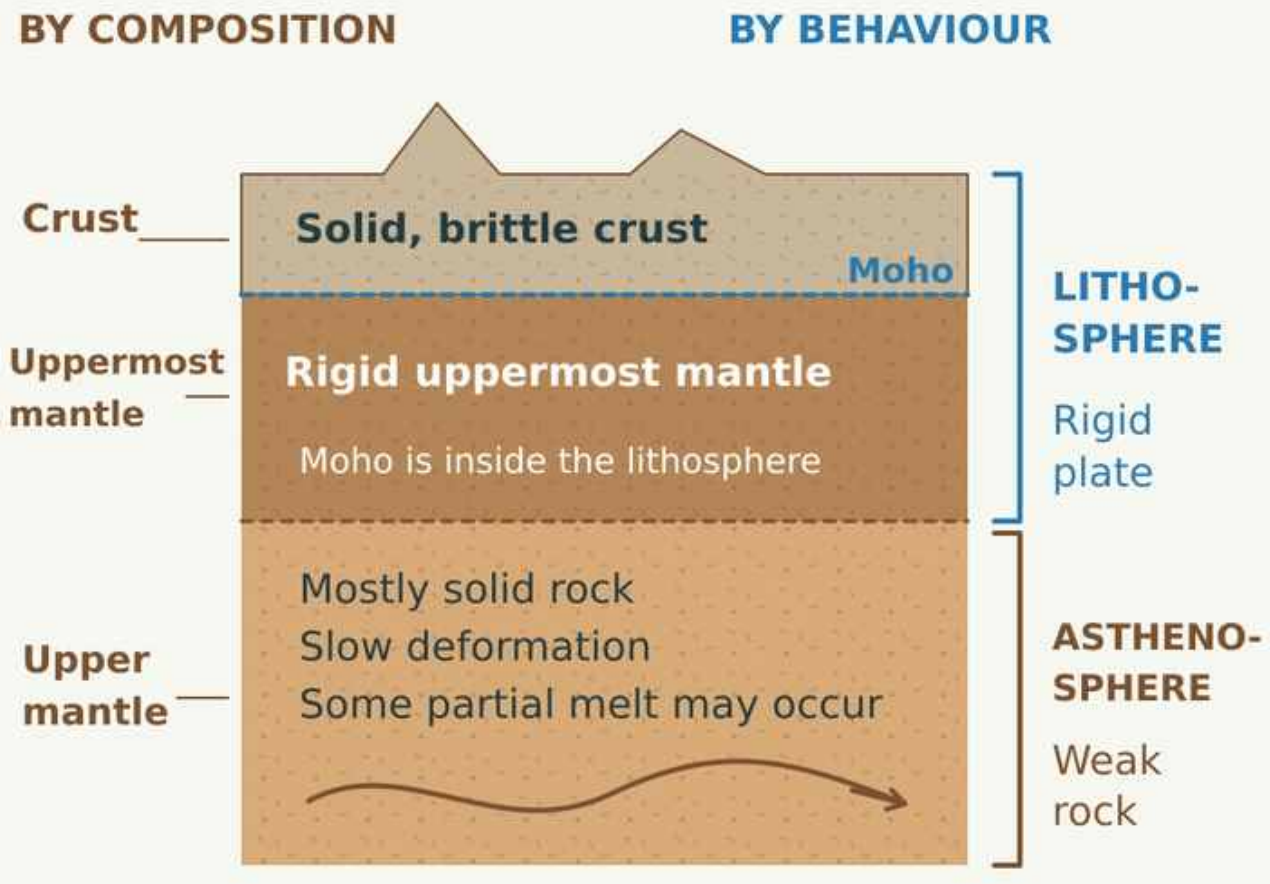
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2/5 · ENGLISH

Day 1 · Topic 6 · Geography D-1

Two ways to divide the same Earth

Composition tells you what; mechanics tells you how



Lithosphere = crust + uppermost mantle

Asthenosphere supplies magma; it is not a liquid sea.

Lithosphere thickness varies with age and tectonic setting.
The asthenosphere is the weaker upper mantle beneath it.

References: Source Index
Depths vary by region; cross-section not to scale

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Day 1 · Topic 6 · Geography D-1

Our samples barely scratch the crust

Most of the deep interior is inferred from evidence



Mines: 3–4 km • magma: source depth uncertain

DEPTH BELOW SURFACE	LAYER / EVIDENCE
Moho	**Base of crust** Crust density: 2.6–2.9 g/cm³
660–670 km	**Upper / lower mantle boundary** Mantle density: 3.4–5.6 g/cm³
2,900 km	**Gutenberg: mantle → outer core** Density jumps ≈5.6 → 9.9 g/cm³ Pressure at mantle base: ≈136 GPa
≈5,150 km	**Inner-core boundary** Outer: 9.9–12.2; inner: 12.8–13.1 g/cm³
6,371 km	**Centre: mean-radius depth** Centre pressure: ≈364 GPa (PREM)

Temperature, pressure and density generally rise with depth.
Equatorial radius ≈6,378 km; mean radius ≈6,371 km.
Indirect: seismic waves, gravity, magnetism and meteorites.

References: Source Index
Depth ladder is schematic, not to scale

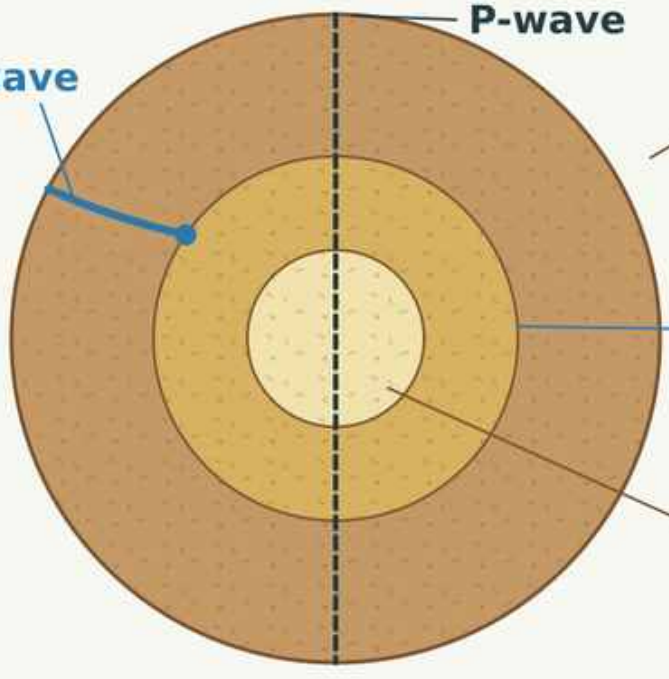
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Day 1 · Topic 6 · Geography D-1

Waves reveal the liquid outer core

P-waves can pass through solid and liquid layers



SOLID MANTLE
P- and S-waves pass

LIQUID OUTER CORE
S-waves cannot pass through this layer.

SOLID INNER CORE
Iron + some nickel

THREE BOUNDARY / STATE TRAPS

01 Weak asthenosphere ≠ liquid outer core

02 Moho = crust / mantle; Gutenberg = mantle / core

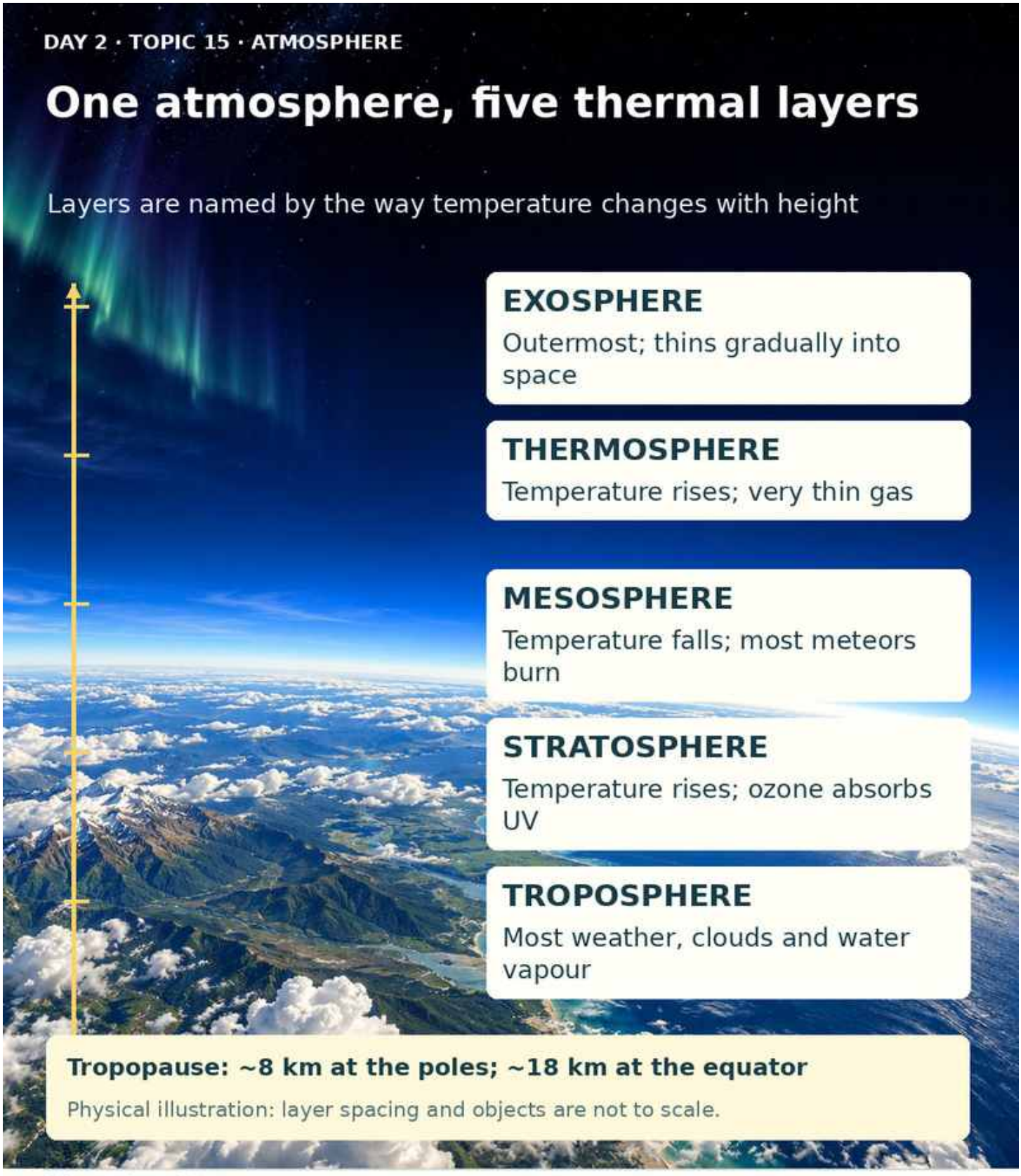
03 Conrad lies within continental crust; it is not universal

Upper/lower mantle boundary: ≈660 km in modern geophysics.
"Repetti" is an older, rarely used name for a deeper boundary.
"Lehmann" is ambiguous: say inner-core boundary here.

References: Source Index
Radial P path (normal incidence); layers not to scale

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References: Source Index

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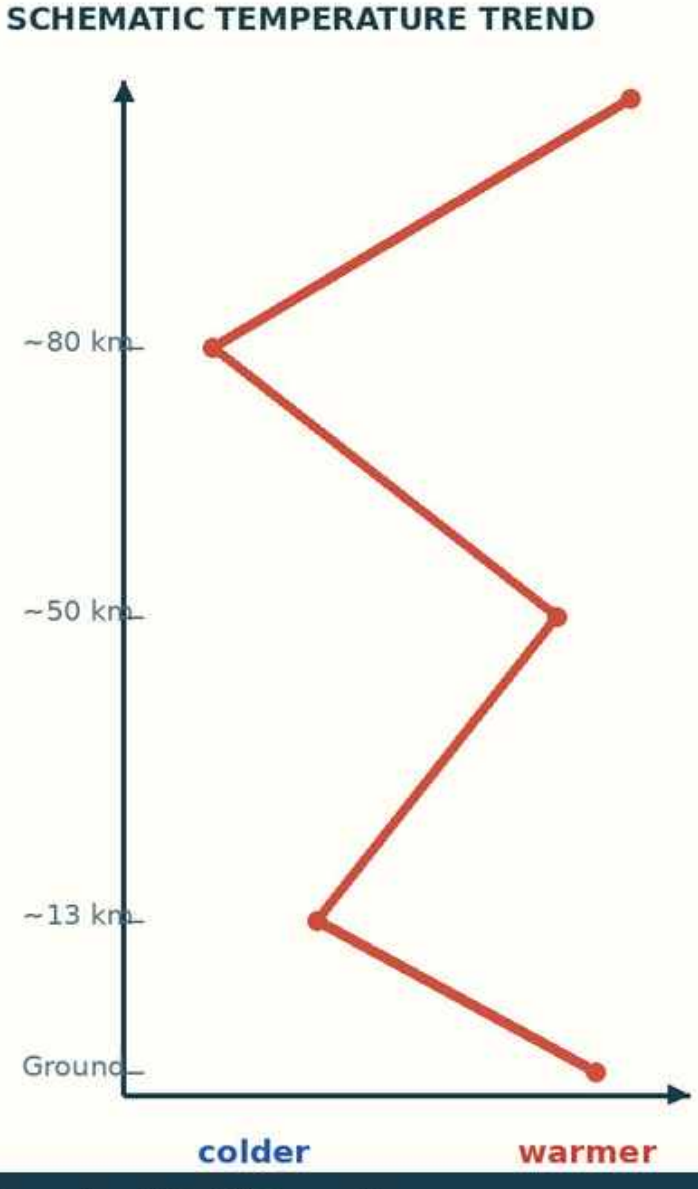
1/6

DAY 2 · TOPIC 15 · ATMOSPHERE

Temperature does not fall forever

Read the direction, then name the layer





Normal tropospheric lapse rate: about 6.5°C per km

Heights are approximate; curve shape is schematic, not a measured sounding.

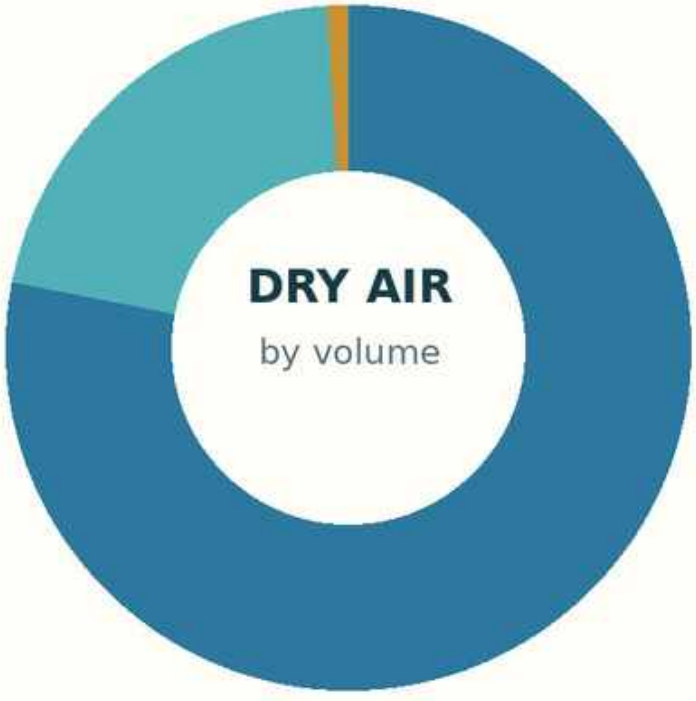
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DAY 2 · TOPIC 15 · ATMOSPHERE

Dry air is mostly nitrogen and oxygen

Water vapour is variable and is excluded from a dry-air composition



Nitrogen
78.08%

Oxygen
20.95%

Argon + traces
~0.97%

Small share does not mean small effect

CO_2 is about 0.04% of dry air, yet it matters to the radiation balance. Water vapour is the most abundant greenhouse gas and varies greatly.

Rounded composition. Do not mix variable water vapour into the dry-air total.

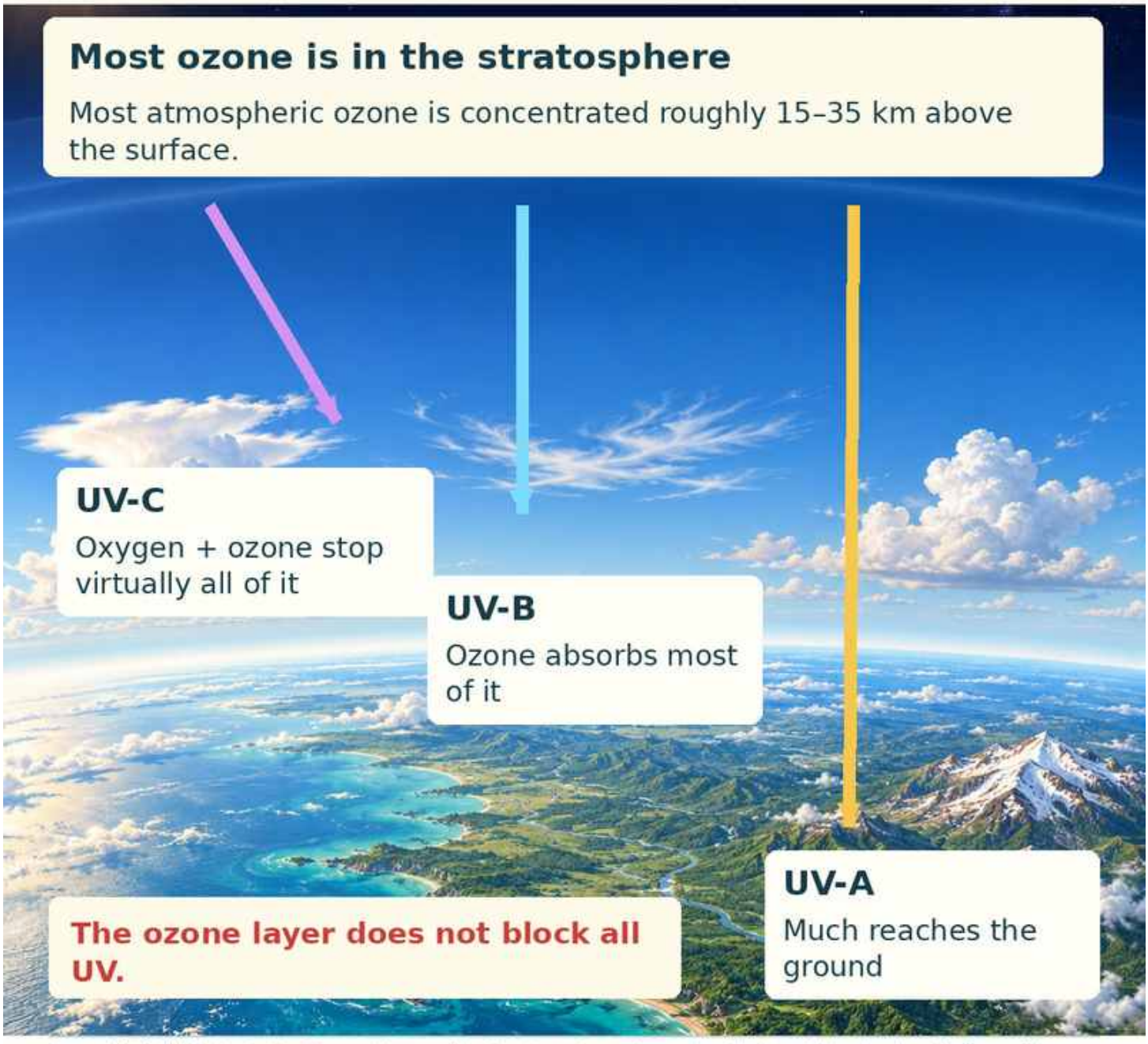
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3/6

DAY 2 · TOPIC 15 · ATMOSPHERE

Ozone filters ultraviolet sunlight

Ozone protection and greenhouse warming are different mechanisms



Source: NASA / WMO, Twenty Questions and Answers About the Ozone Layer · Arrows show the three UV bands schematically; no distance or flux scale

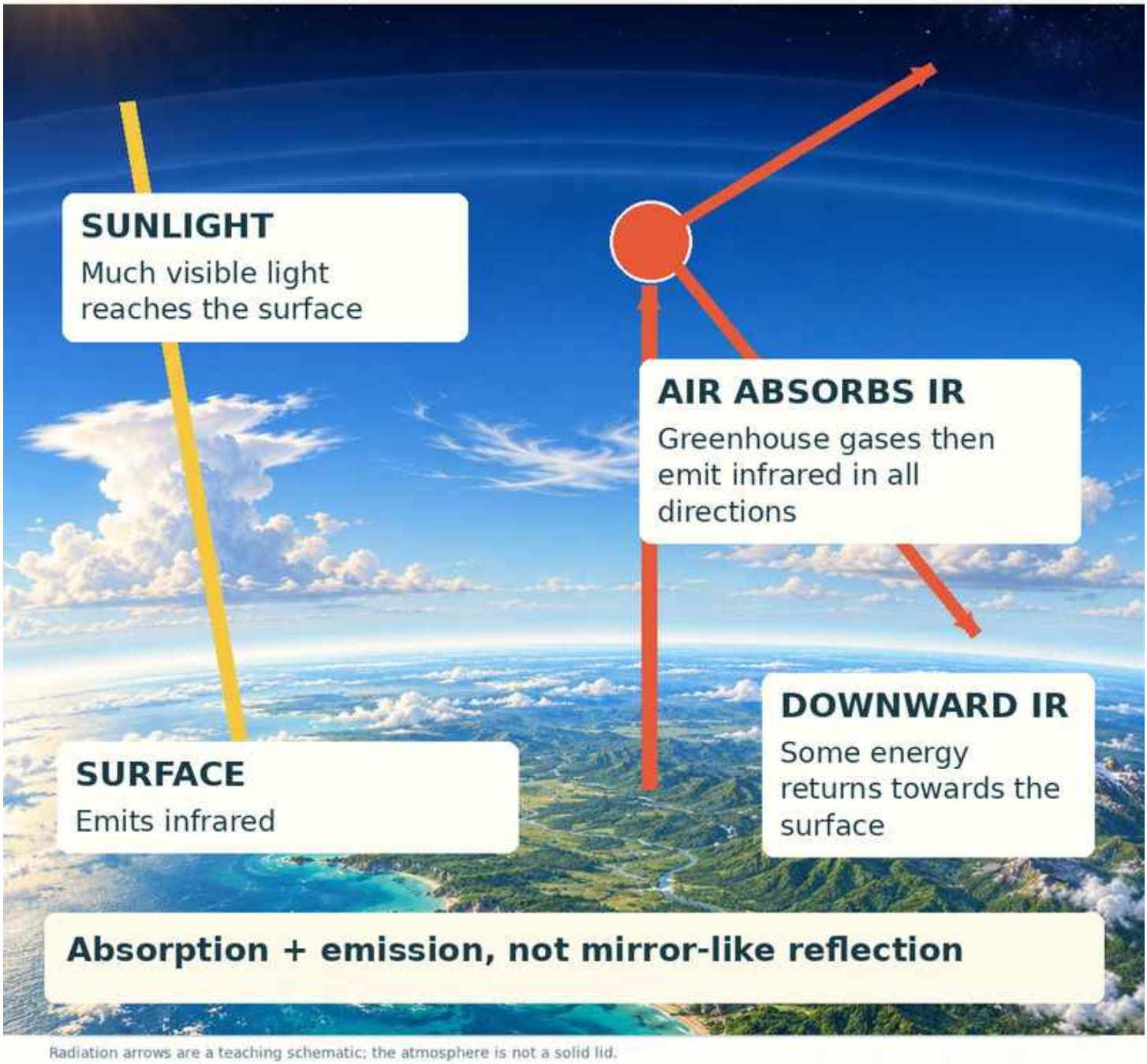
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DAY 2 · TOPIC 15 · ATMOSPHERE

Greenhouse gases absorb and re-emit

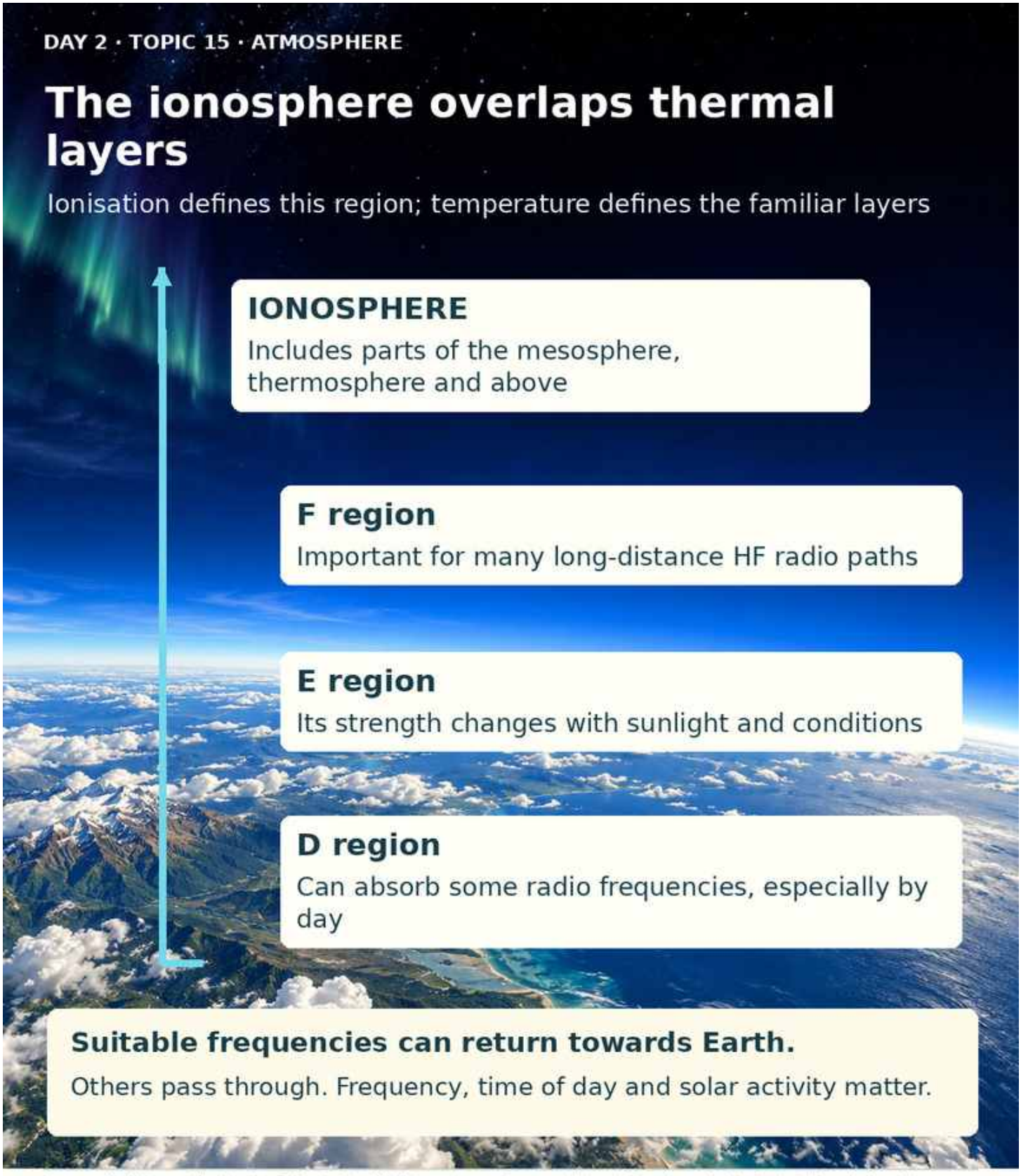
Infrared radiation is exchanged between the surface and atmosphere



Radiation arrows are a teaching schematic; the atmosphere is not a solid lid.

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5/6


DAY 2 · TOPIC 15 · ATMOSPHERE
The ionosphere overlaps thermal layers
Ionisation defines this region; temperature defines the familiar layers
IONOSPHERE
Includes parts of the mesosphere, thermosphere and above
F region
Important for many long-distance HF radio paths
E region
Its strength changes with sunlight and conditions
D region
Can absorb some radio frequencies, especially by day
Suitable frequencies can return towards Earth.
Others pass through. Frequency, time of day and solar activity matter.
Sources: NOAA Space Weather Prediction Center; NASA Ionosphere · Open-ended bracket is schematic. Region heights and strengths vary
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6/6

DAY 2 · TOPIC 16 · DRAINAGE

Dendritic or trellis? Read the relief

A drainage pattern is the arrangement of channels and tributaries



Relatively uniform rock

Tributaries join at varied angles; resembles branches of a tree.

Alternating hard / soft belts

Main streams follow valleys; short tributaries often join near right angles.

Ask what controls the channels

Uniform surface, rock structure and slope give different clues.

Illustrative terrain and flow arrows, not maps of named river basins.

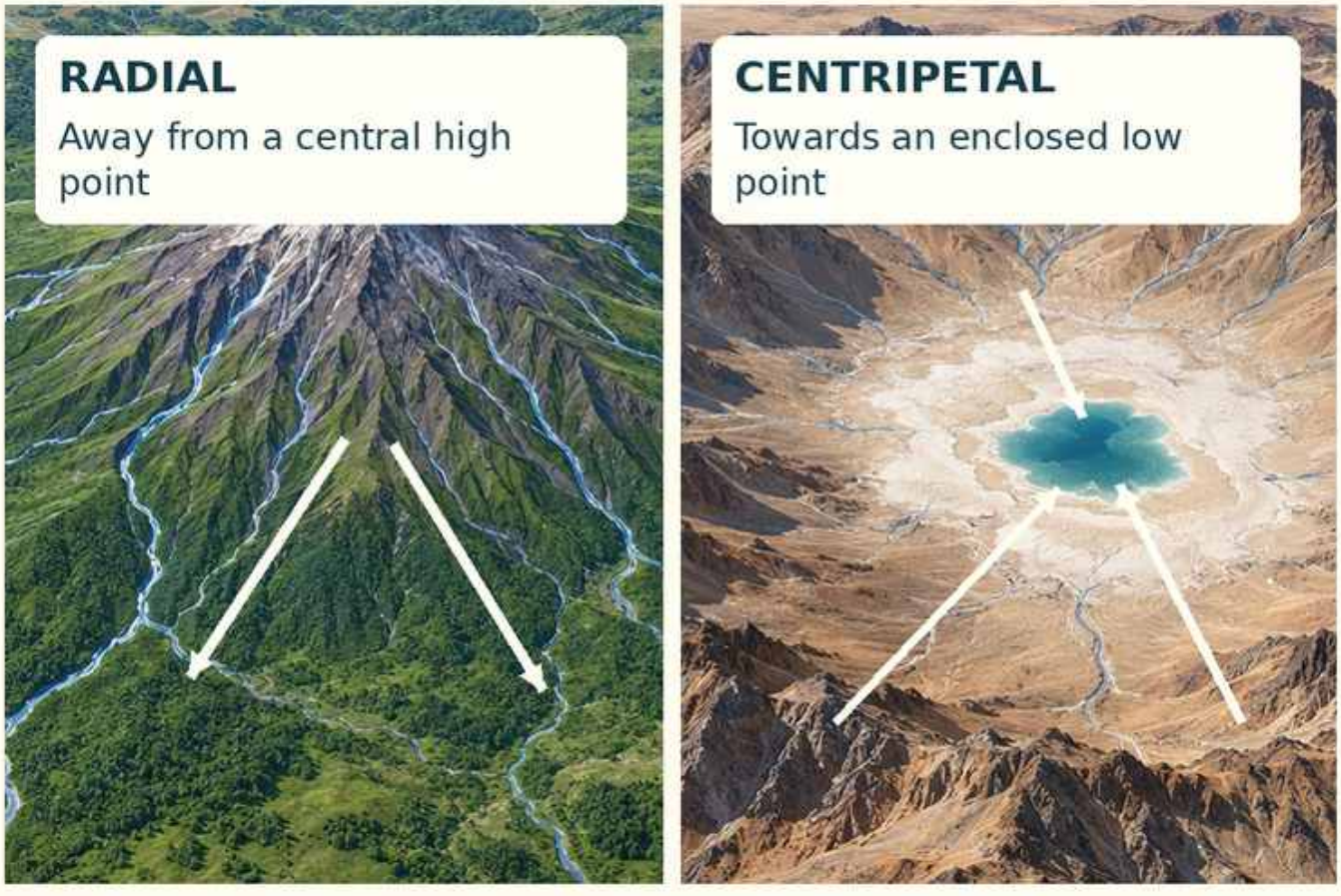
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1/6

DAY 2 · TOPIC 16 · DRAINAGE

Outward or inward? Follow the slope

Radial and centripetal patterns point in opposite directions



A dome or volcanic cone

Streams descend in different directions from the central upland.

A closed basin

Streams converge on an inland lake or depression; the basin has no external outlet.

Water flows downslope. Illustrations are idealised examples.

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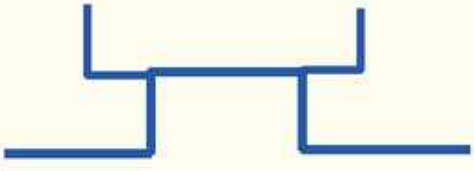
DAY 2 · TOPIC 16 · DRAINAGE

Four more patterns to recognise

Use the geometry together with its physical setting

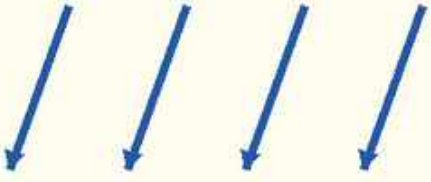


RECTANGULAR



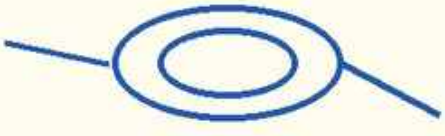
Jointed or faulted rock: angular bends

PARALLEL



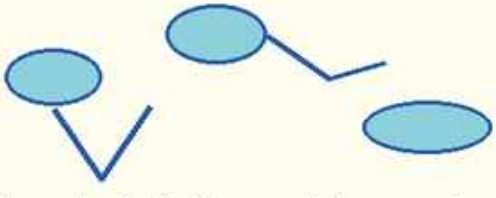
Steep, uniform slope: similar flow directions

ANNULAR



Concentric rock bands around a dome / basin

DERANGED



Disrupted drainage: lakes and no organised pattern

Plan-view sketches are schematic; terrain photograph-style artwork is illustrative.

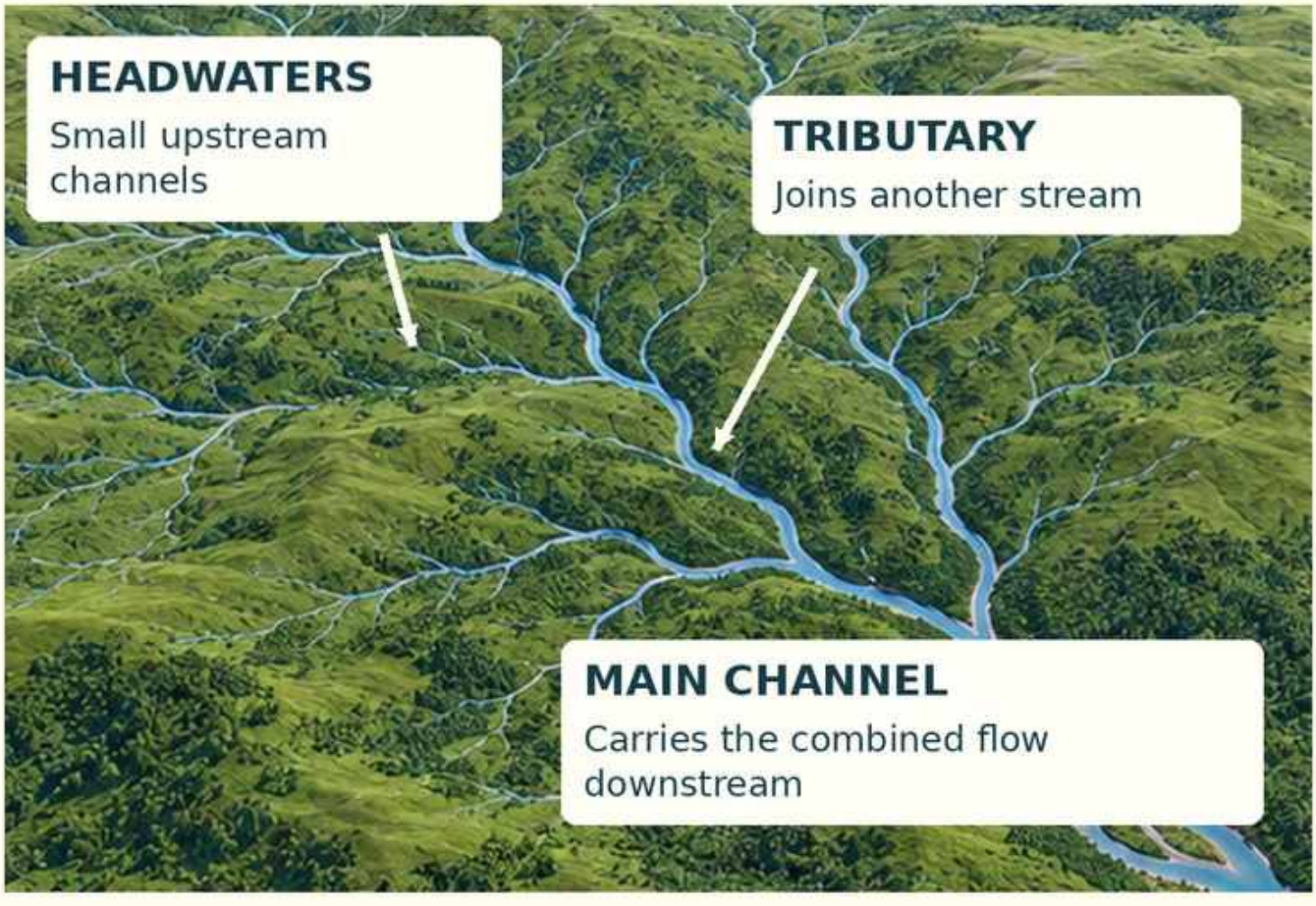
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DAY 2 · TOPIC 16 · DRAINAGE

A basin collects; a divide separates

Read the river network as one connected system



Drainage basin / catchment

The land whose runoff reaches a river and its tributaries.

Drainage divide

Boundary between basins. “Watershed” can also mean the catchment area; read the context.

The image illustrates a network; no surveyed basin boundary is claimed.

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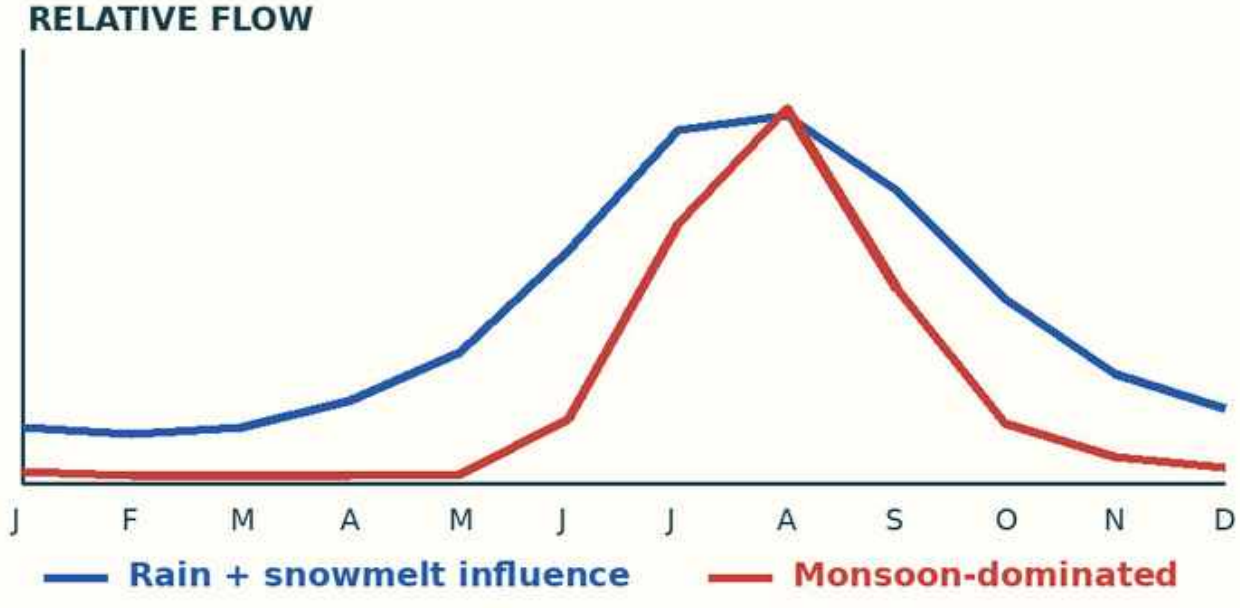
4/6

DAY 2 · TOPIC 16 · DRAINAGE

River regime means the yearly rhythm

Rainfall, snowmelt and storage control the pattern of flow





Compare timing, not invented discharge

Illustrative curves, not measurements for a named river.

Illustrative river-regime curves.

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5/6

DAY 2 · TOPIC 16 · DRAINAGE

Relief alone cannot tell the whole story

Ask whether the river predates the relief or inherited its route



ANTECEDENT

1. River exists first
2. Land rises across its course
3. River maintains its course by incision

SUPERIMPOSED

1. River develops on an overlying cover
2. Erosion removes that cover
3. Inherited course cuts into underlying structure

Sequence sketches explain origin; the illustrative terrain is not a named river.

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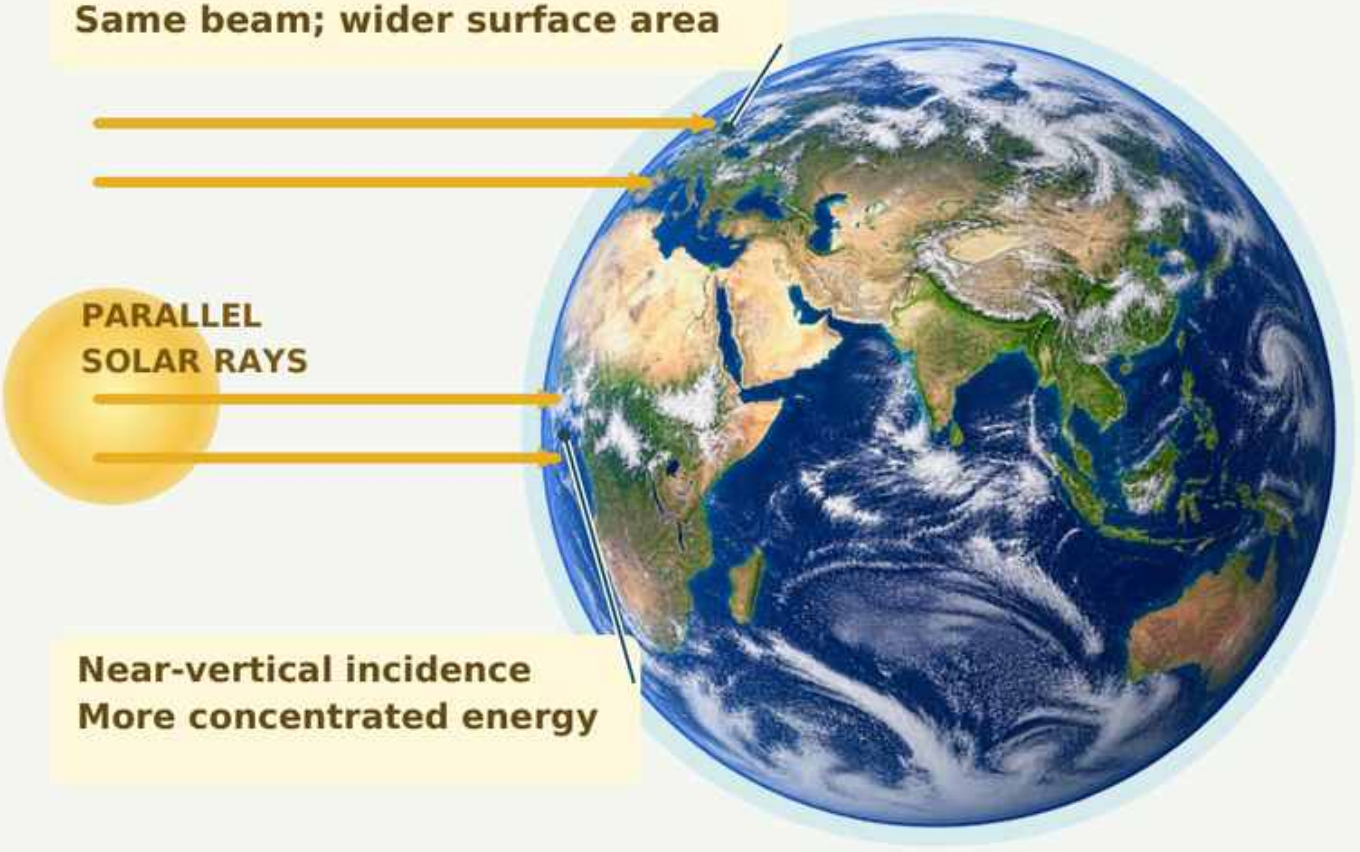
6/6

DAY 3 · TOPIC 25 · PHYSICAL GEOGRAPHY

Same beam. Different heating.

The angle of incidence changes energy received per unit area.

Oblique incidence
Same beam; wider surface area



Near-vertical incidence
More concentrated energy

Illustrative geometry, not a distance-scale drawing

A low Sun spreads its energy across a wider ground area.
Oblique rays also pass through more atmosphere.
At the subsolar point, rays can be nearly perpendicular.

References: Source Index

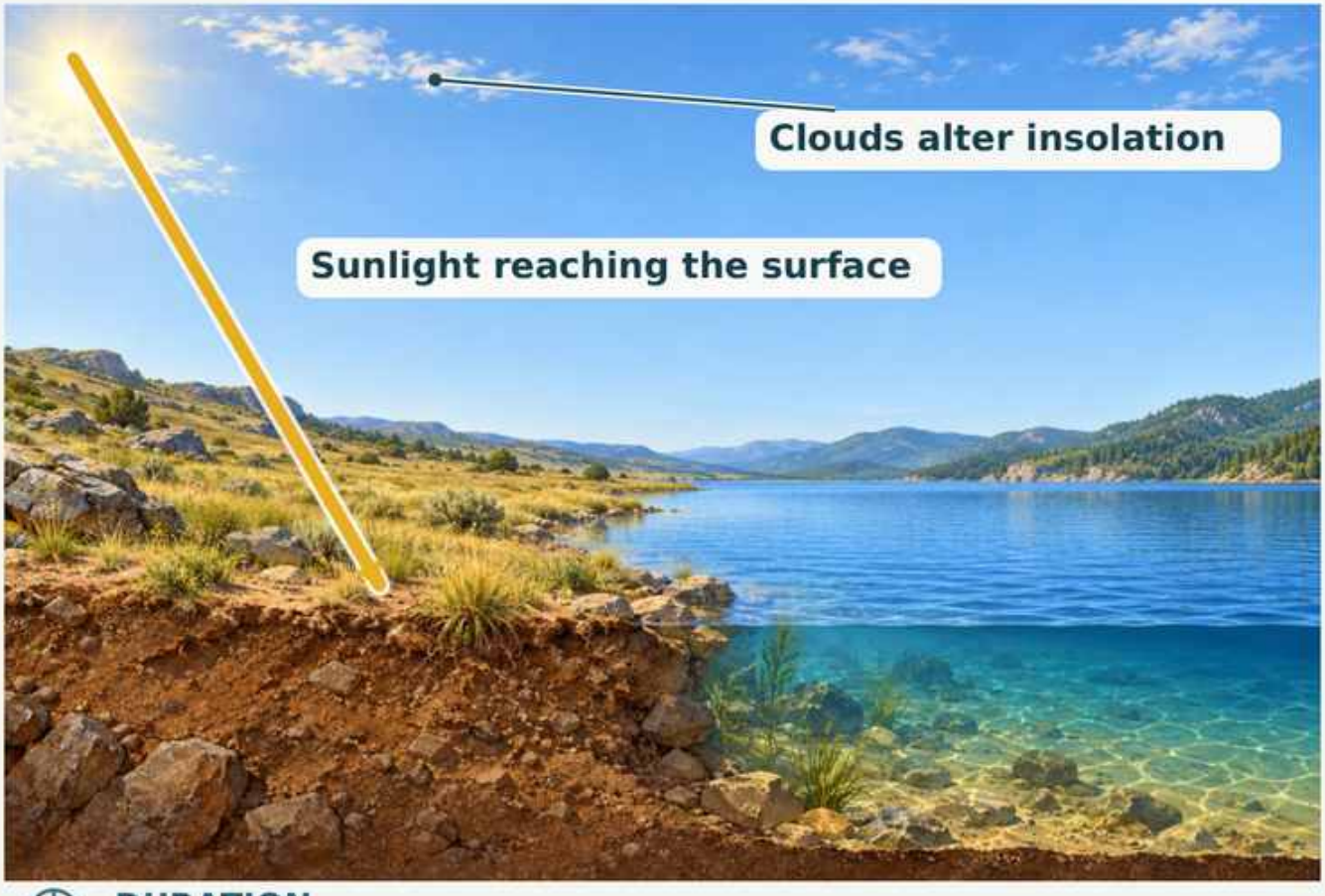
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1/6 · ENGLISH

DAY 3 · TOPIC 25 · PHYSICAL GEOGRAPHY

Three controls work together

Angle, length of day and atmospheric conditions matter.



DURATION
More daylight hours can raise daily insolation.

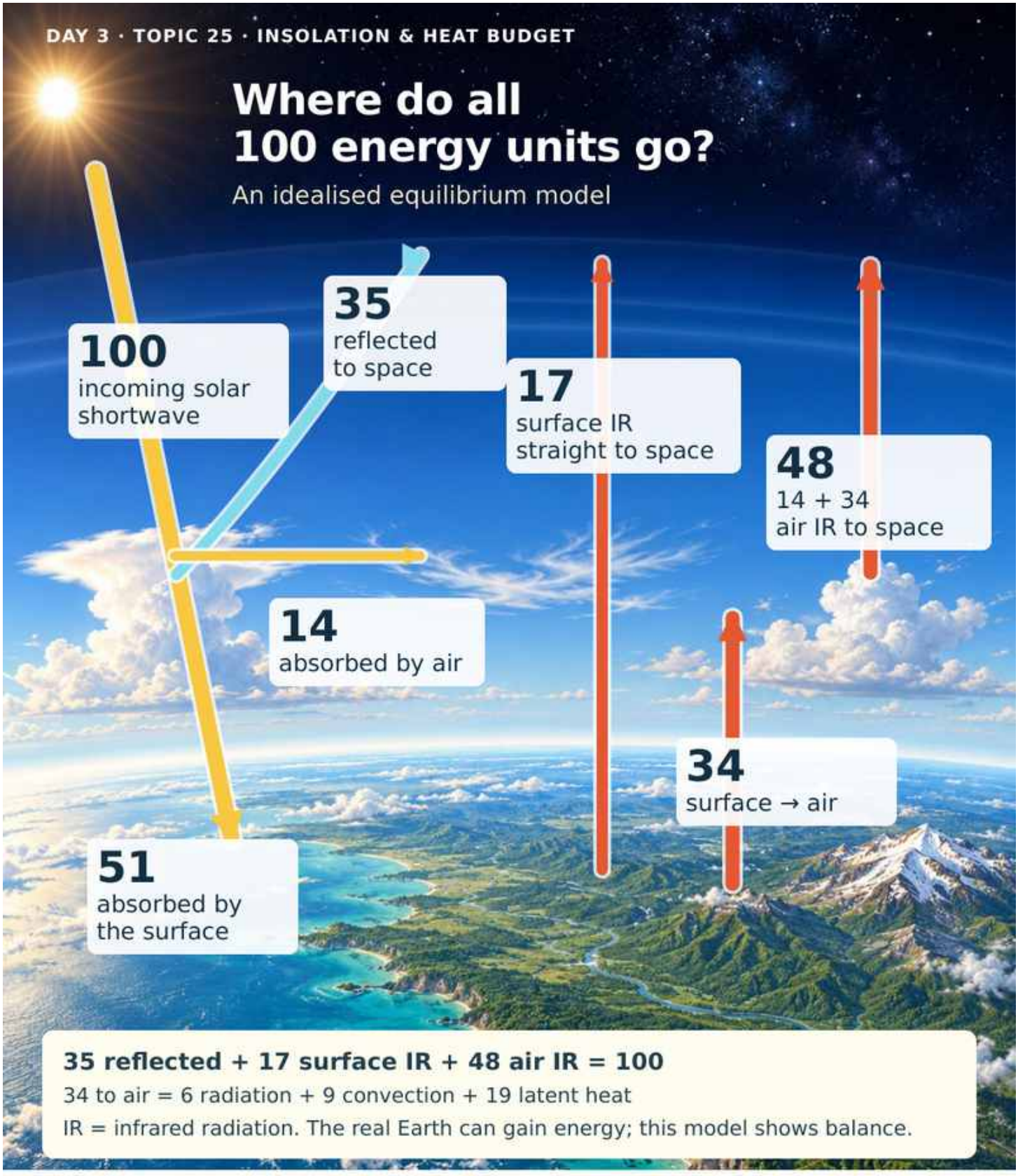
ANGLE
A higher Sun concentrates the same beam.

ATMOSPHERE
Clouds, dust and water vapour alter the amount.

References: Source Index

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2/6 · ENGLISH



References: Source Index

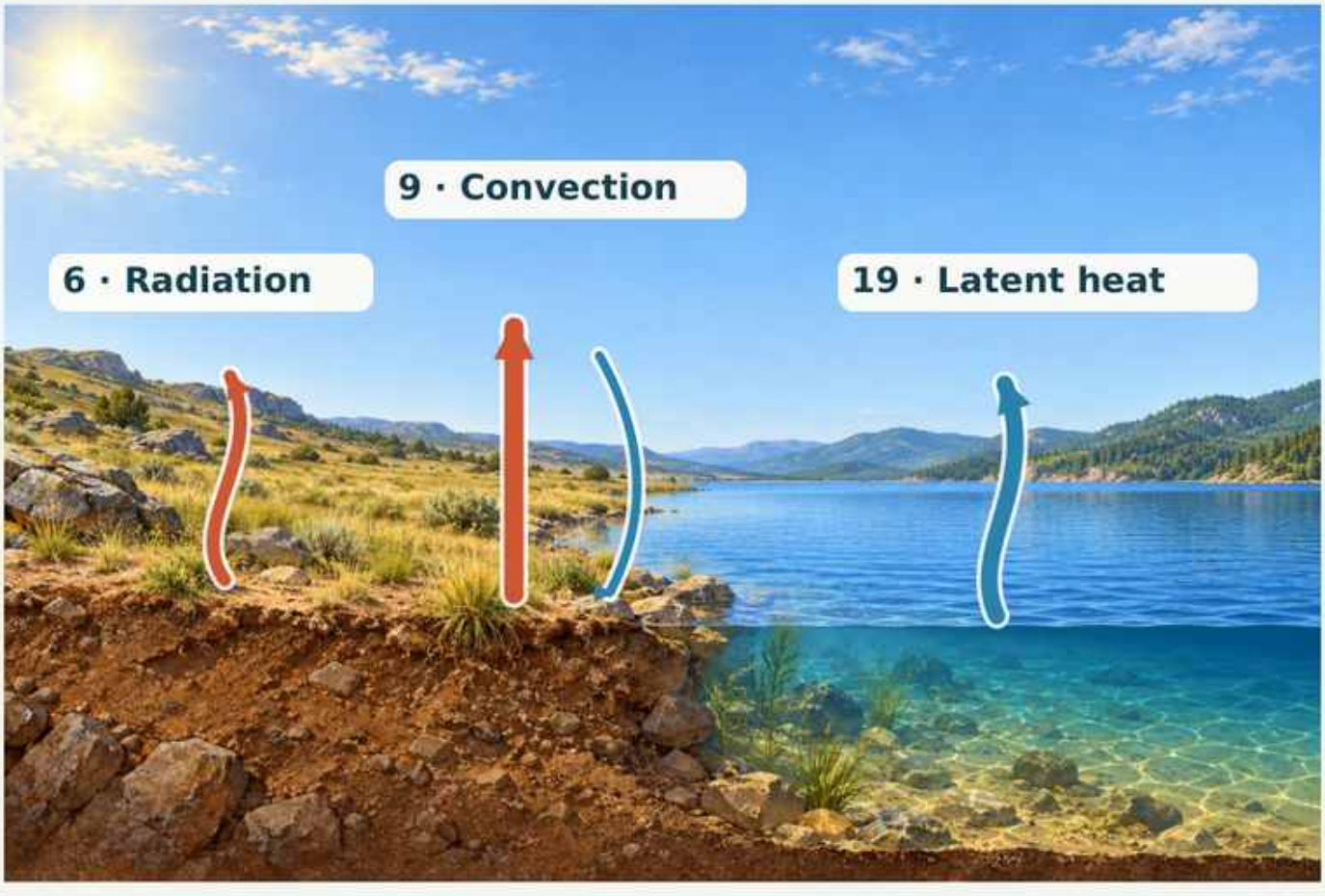
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3/6 · ENGLISH

DAY 3 · TOPIC 25 · PHYSICAL GEOGRAPHY

How the surface warms the air

The model's 34-unit surface-to-atmosphere transfer, illustrated.



6 + 9 + 19 = 34 units transferred from surface to air. Conduction warms air touching the ground; rising air and turbulence carry heat upward. Evaporation stores latent heat; condensation releases it in the atmosphere.

Numbers belong to this idealised 100-unit model.

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4/6 · ENGLISH

DAY 3 · TOPIC 25 · PHYSICAL GEOGRAPHY

Shortwave in. Longwave out.

Absorption and re-emission help explain the greenhouse effect.



To space

Re-emitted towards surface

Greenhouse gases absorb and re-emit outgoing thermal IR. They do not act as a solid lid.

INCOMING

Mostly shortwave solar radiation from the Sun

OUTGOING

Longwave infrared (IR) emitted by Earth's surface and atmosphere

Conceptual radiation pathways, not to scale.

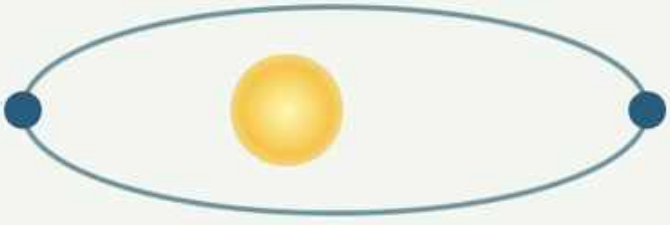
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5/6 · ENGLISH

DAY 3 · TOPIC 25 · PHYSICAL GEOGRAPHY

Three distinctions that prevent wrong answers

Interpret the process, rather than memorising arrows alone.





1 Distance is not the main cause of seasons

Earth is near perihelion in January and aphelion in July.
Axial tilt, solar angle and day length explain the seasons.



REFLECTED



ABSORBED → HEATING

2 Reflection and absorption are different outcomes



IN = OUT

3 Balance is the idealised case

This idealised 100-unit diagram closes the budget.
Actual Earth can warm when absorbed energy exceeds the energy radiated to space.

Orbit eccentricity exaggerated in sketch.

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6/6 · ENGLISH

DAY 4 · TOPIC 36 · GEOGRAPHY

A cold pool beneath warmer air

Temperature inversion on a calm, clear night



Near the surface, temperature rises with height. Frost and trapped pollution can result.

Illustrated valley, not to scale.

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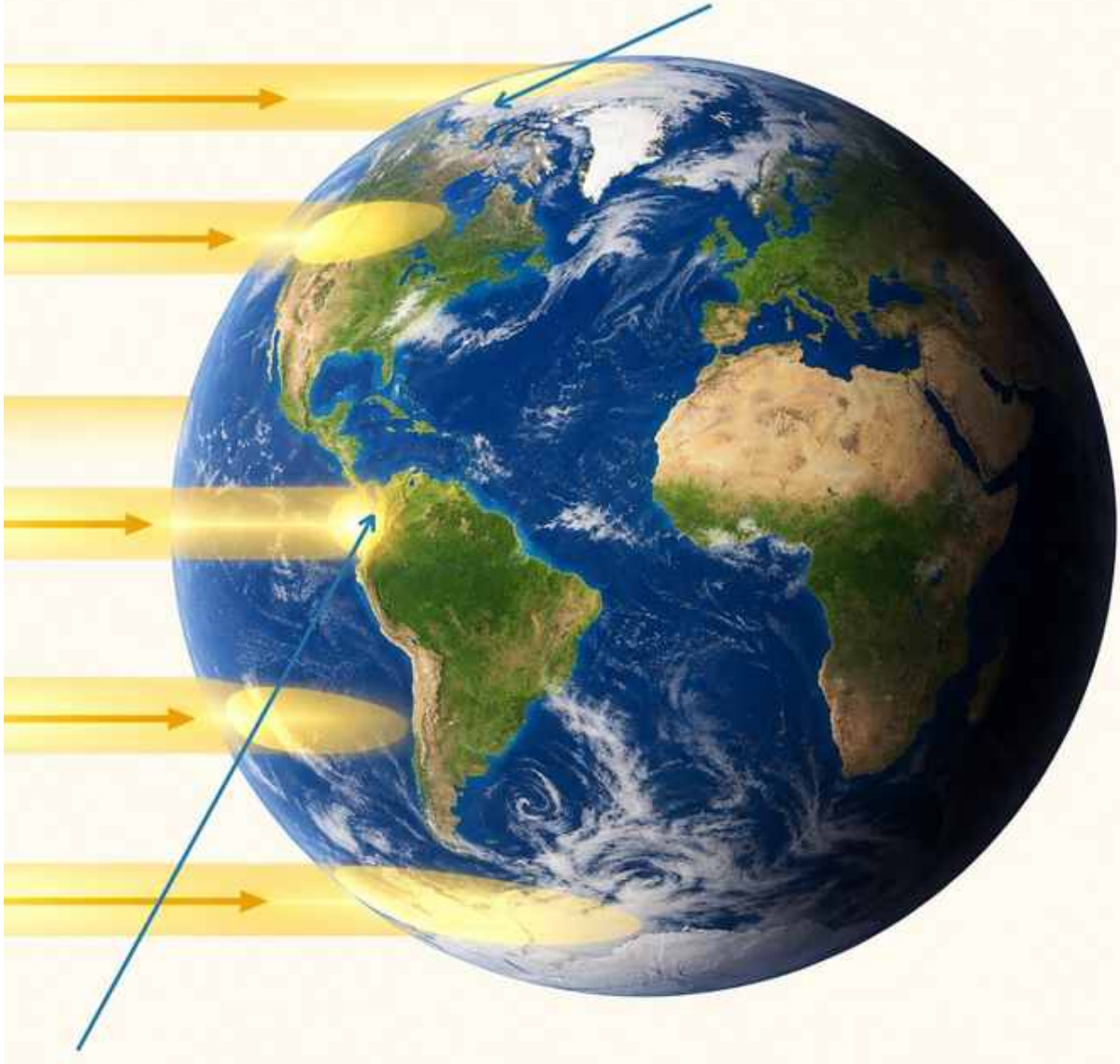
DAY 4

DAY 4 · TOPIC 36 · GEOGRAPHY

Latitude changes sunlight angle

Oblique rays spread energy more widely

High latitudes: oblique sunlight



Near equator: more direct sunlight

Schematic rays, not to scale.

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DAY 4

DAY 4 · TOPIC 36 · GEOGRAPHY

Land heats and cools more quickly

Water moderates nearby coastal temperatures



Coasts usually have a smaller temperature range because water changes temperature more slowly.

Altitude is a separate factor. See the next panel.

Illustrative coast; altitude on the next panel.

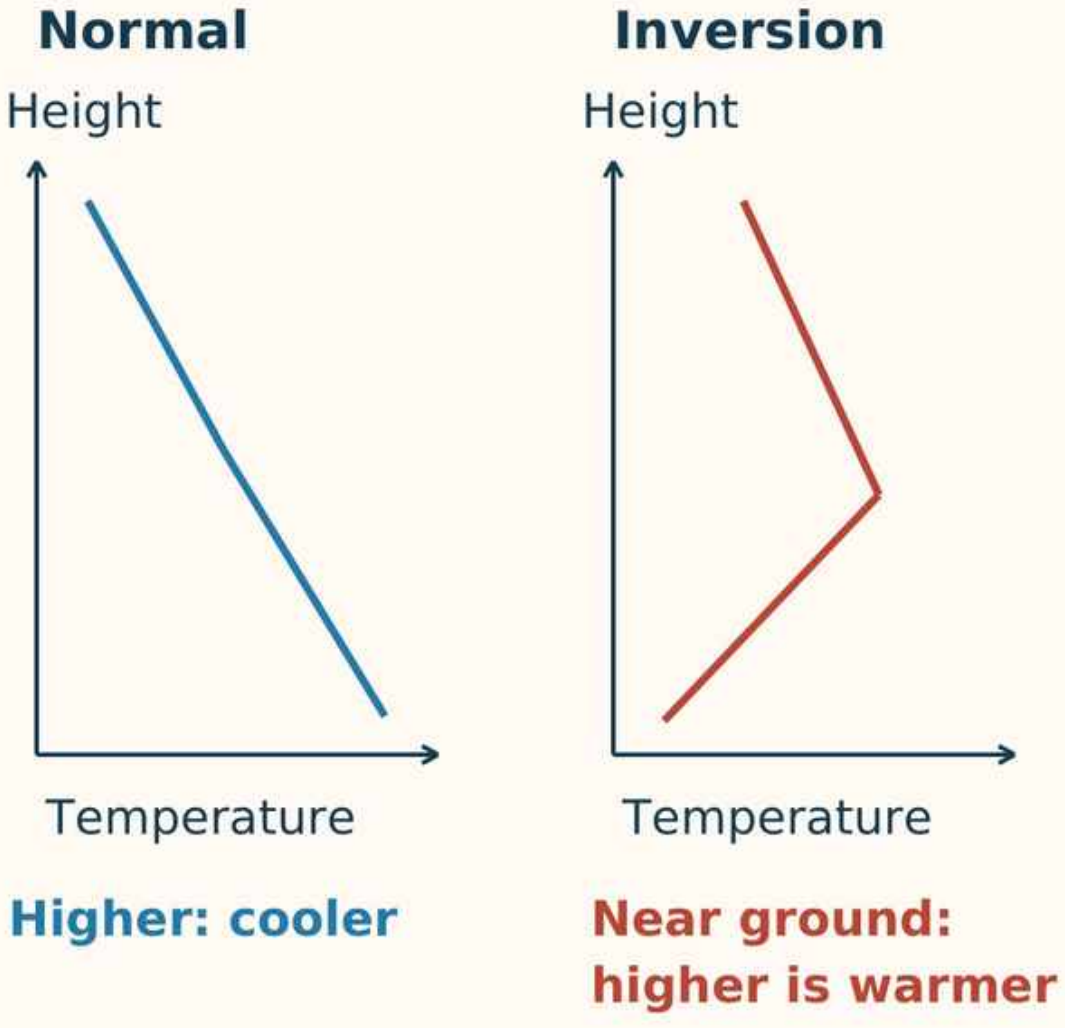
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DAY 4

DAY 4 · TOPIC 36 · GEOGRAPHY

Normal lapse versus inversion

Read temperature along the horizontal axis



Normal lapse rate averages about 6.5°C per km. It is not a fixed rate everywhere.

Qualitative temperature profiles.

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DAY 4

DAY 4 · TOPIC 36 · GEOGRAPHY

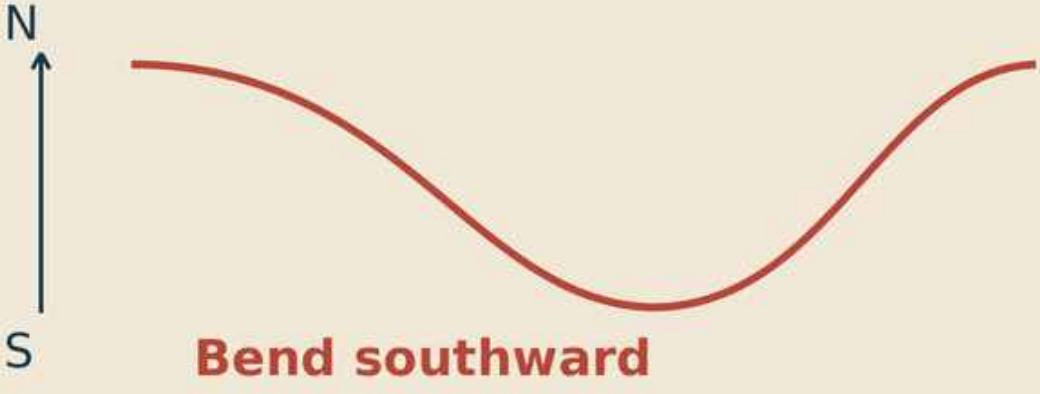
January isotherms bend

An isotherm joins places at equal temperature

North Atlantic: relatively warm ocean



Siberian plain: cold continental interior



Northern Hemisphere schematic. This is not a geographical map.

January temperature distribution.

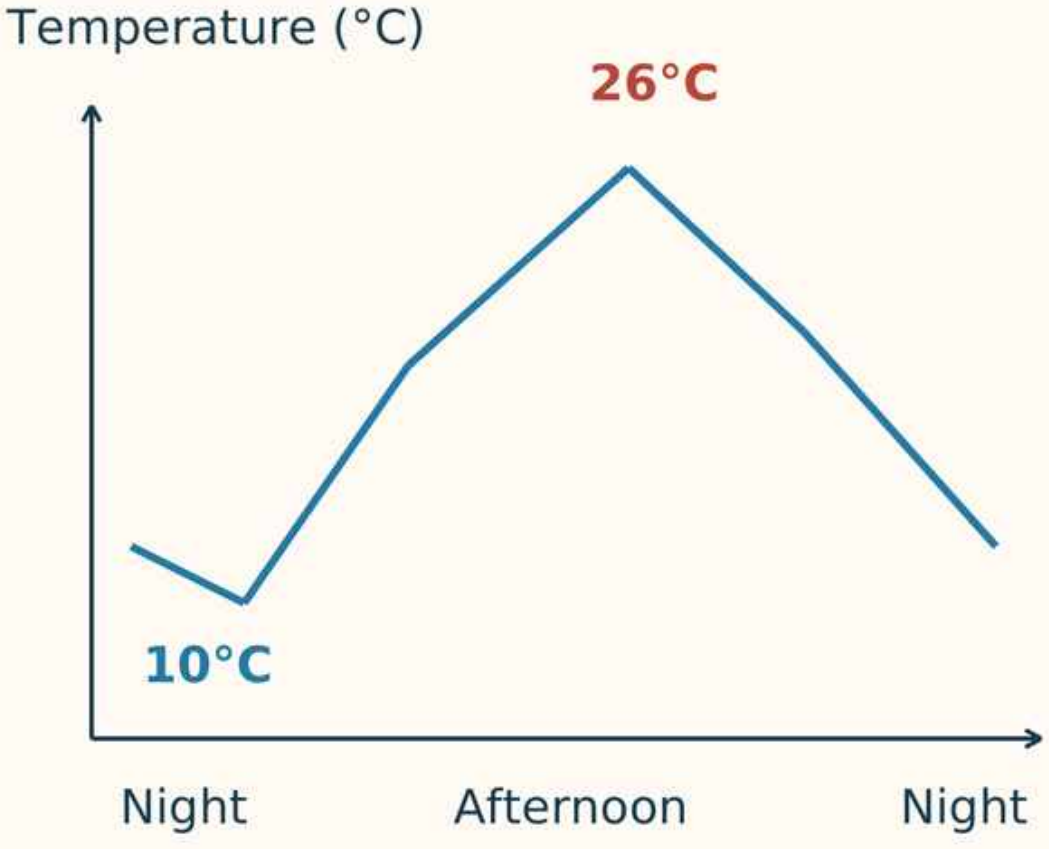
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Daily temperature range

Maximum minus minimum in one day



26°C − 10°C = 16°C

The day’s maximum and minimum, not monthly averages.

Source: temperature-range definition · illustrative values

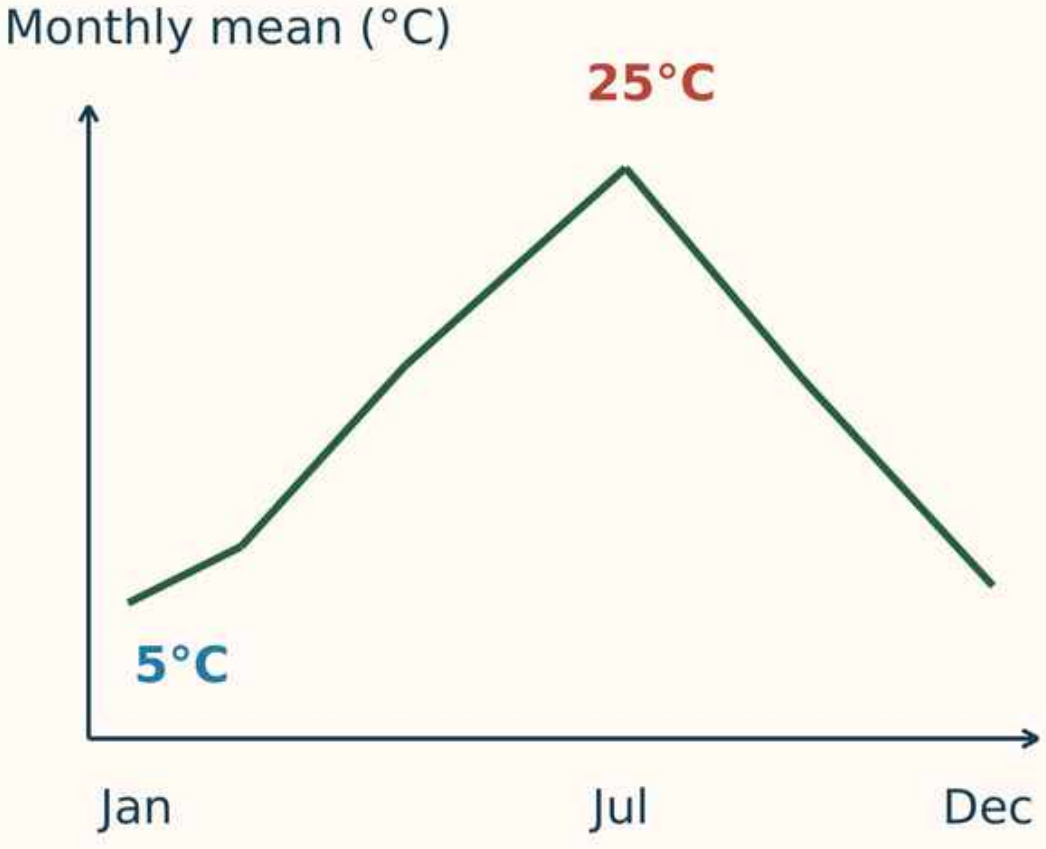
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Annual temperature range

Compare the warmest and coldest monthly means



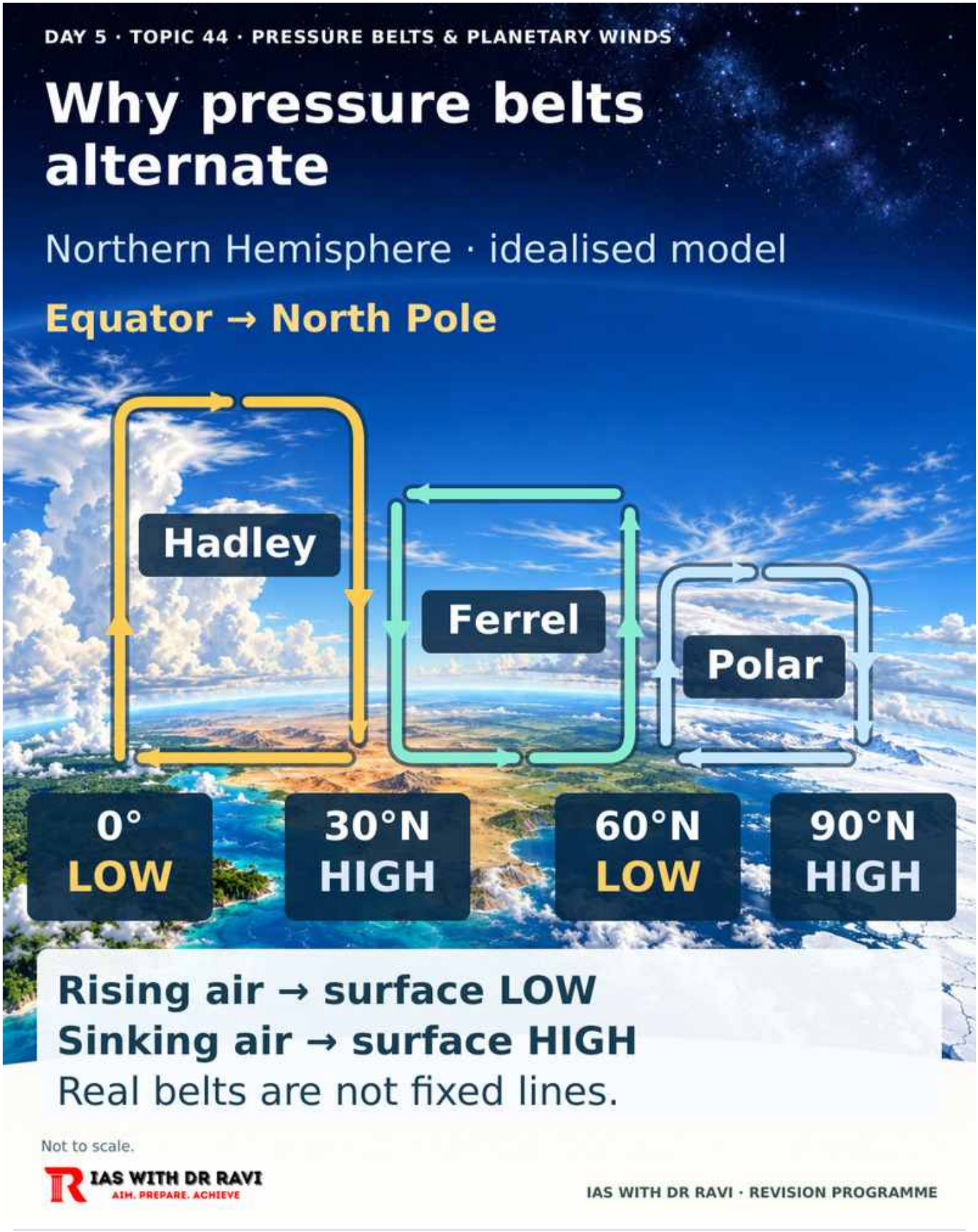
25°C − 5°C = 20°C

This uses monthly means, not the year's hottest and coldest single days.

Source: temperature-range definition · illustrative Northern Hemisphere pattern

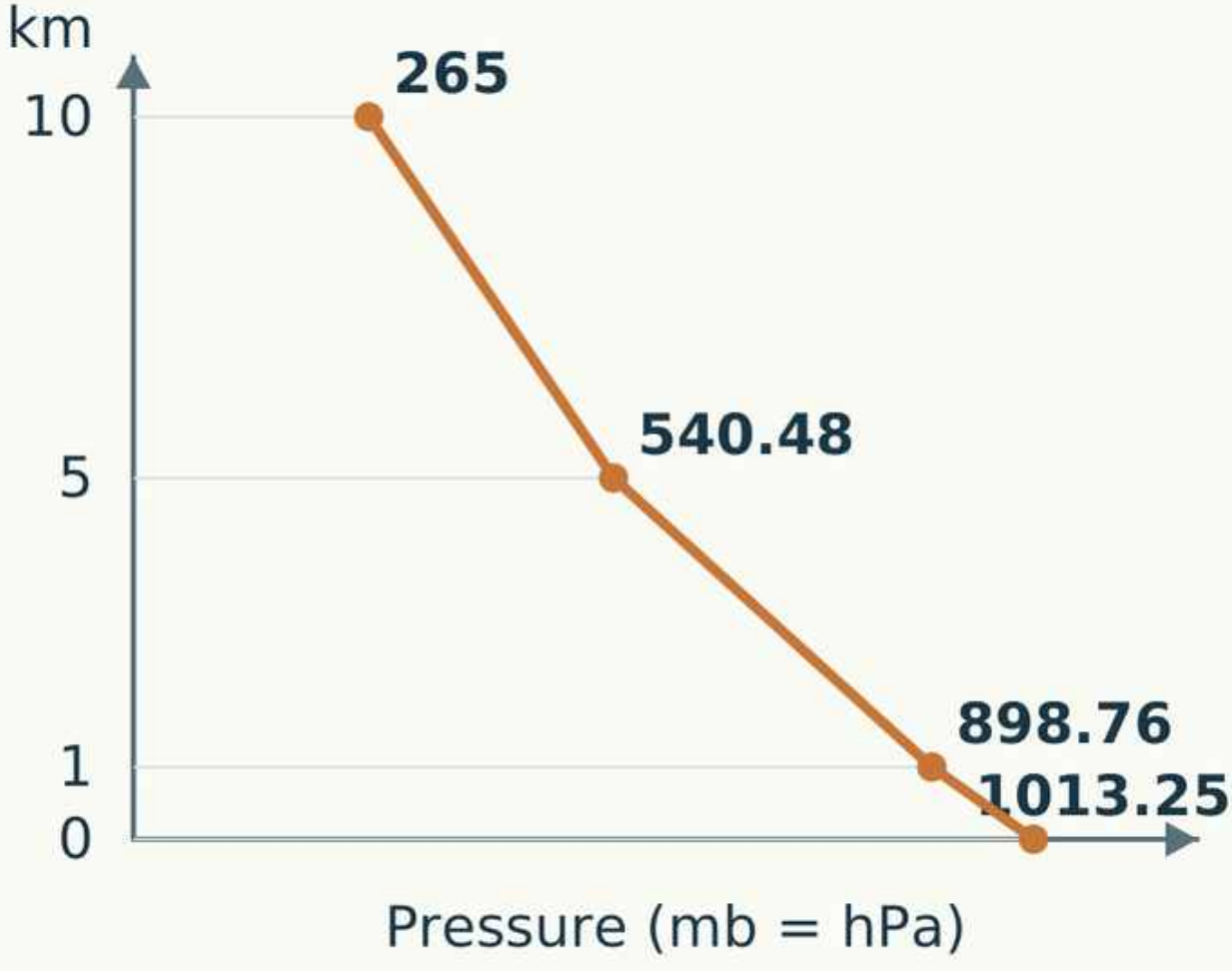
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DAY 4


DAY 5 · TOPIC 44 · PRESSURE BELTS & PLANETARY WINDS
Why pressure belts alternate
Northern Hemisphere · idealised model
Equator → North Pole
Hadley
Ferrel
Polar
0°
LOW
30°N
HIGH
60°N
LOW
90°N
HIGH
Rising air → surface LOW
Sinking air → surface HIGH
Real belts are not fixed lines.
Not to scale.
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DAY 5 · TOPIC 44 · 02

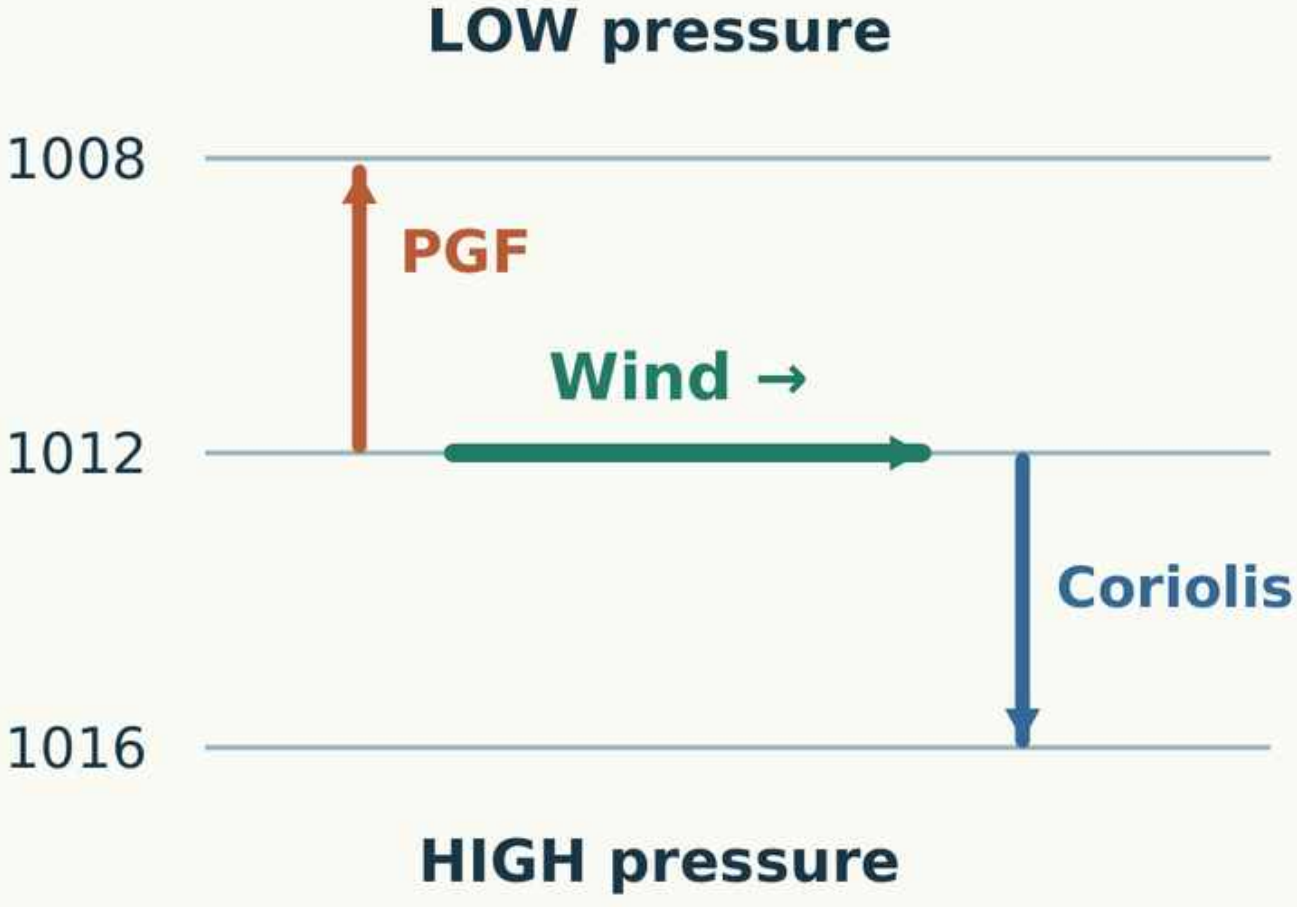
Pressure falls with height, not linearly



At 5 km: a little over half sea-level pressure.
At 10 km: about one quarter.
1 mb =1 hPa =100 Pa.

DAY 5 · TOPIC 44 · 03

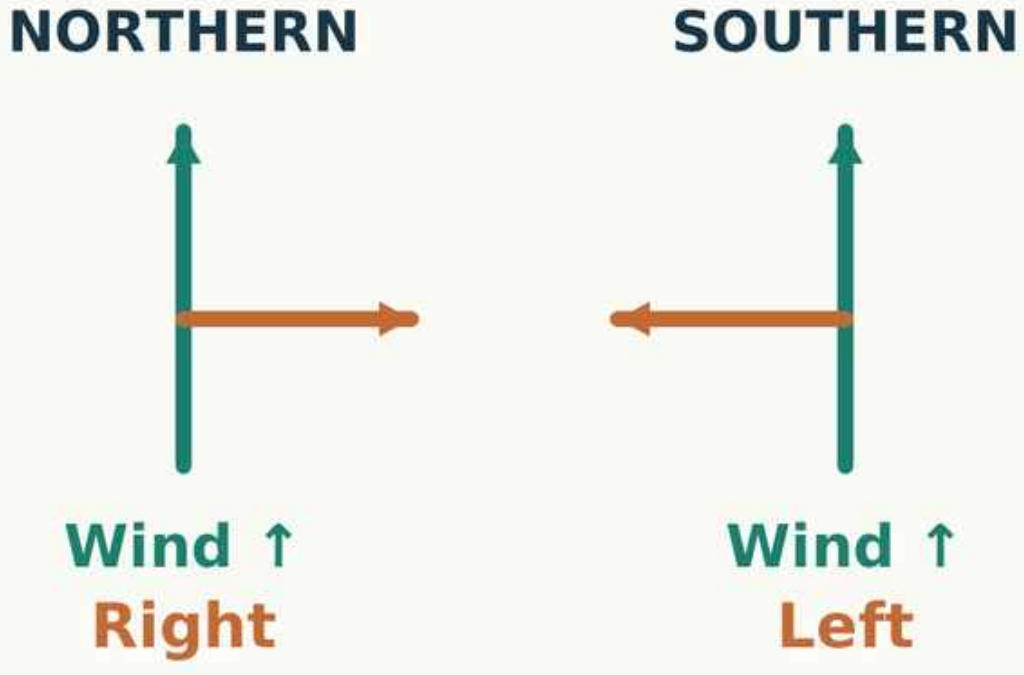
Above friction: wind follows isobars



Northern Hemisphere model
Straight isobars; steady flow.
Pressure-gradient force balances Coriolis.
The wind is parallel to the isobars.

DAY 5 · TOPIC 44 · 04

Coriolis turns flow sideways



> It acts perpendicular to wind velocity.
>
> Horizontal effect: zero at the equator; greatest at the poles for the same speed.

Faster motion → stronger Coriolis effect. It is not generally perpendicular to the pressure-gradient force.

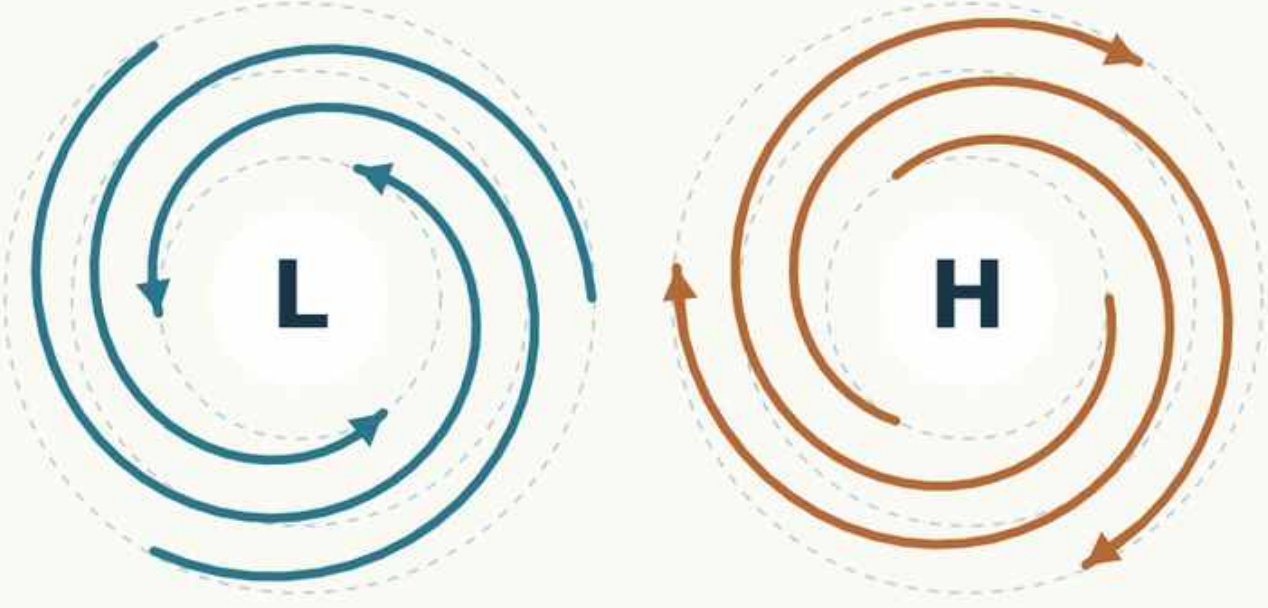
NOAA Origin of Wind; FAA Balloon Flying Handbook, weather chapter

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DAY 5 · TOPIC 44 · 05

Surface winds spiral: Northern Hemisphere



LOW

Anticlockwise + inward
Air converges and rises.

HIGH

Clockwise + outward
Air sinks and diverges.

> Southern Hemisphere: rotation reverses. Low still converges; high still diverges.

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DAY 5 · TOPIC 44 · 06

Three wind belts in each hemisphere

Surface belt	Northern	Southern
Trades 0°–30°	NE → SW	SE → NW
Westerlies 30°–60°	SW → NE	NW → SE
Polar easterlies 60°–90°	NE → SW	SE → NW

Winds are named for where they come FROM.

> Trades and polar winds are both easterlies, but occupy different latitude belts.

DAY 5 · TOPIC 44 · 07

Four types, seven pressure belts

Belt	Latitude	Main cause
Equatorial low	0°	Thermal: heating, ascent
Subtropical highs	30°N/S	Dynamic: descending air
Subpolar lows	60°N/S	Dynamic: convergence, ascent
Polar highs	90°N/S	Thermal: cold, dense air

1 equatorial +2 subtropical +2 subpolar +2 polar = **7**

Doldrums: equatorial low.
Horse latitudes: subtropical highs.

DAY 5 · TOPIC 45 · 01

Compare the rivers: length and source State

Godavari	**1,465 km**	Maharashtra
Krishna	**1,400 km**	Maharashtra
Penna	**597 km**	Karnataka
Tungabhadra	**531 km**	Karnataka
Nagavali	**256 km**	Odisha
Vamsadhara	**254 km**	Odisha

> The tributary Tungabhadra is longer than both Nagavali and Vamsadhara.

India-WRIS basin series; CWC Vamsadhara/Nagavali yearbook

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DAY 5 · TOPIC 45 · 02

Godavari: gorge → barrage → delta



Interpretive illustration · not a site photograph

- **Kunavaram**
  Sabari joins on the left bank
- **Papi hills → Polavaram**
  Gorge opens into a wider valley
- **Dowleswaram**
  Cotton Barrage supplies delta canals
- **Delta branches**
  Gautami and Vasishta branches

> Yanam, on the Gautami, belongs to Puducherry.

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DAY 5 · TOPIC 45 · 03

Krishna projects: upstream to downstream



Interpretive illustration · not a site photograph

1 · Srisailam
Major storage and hydropower

2 · Nagarjuna Sagar
At Vijayapuri South

3 · Pulichintala
Below Nagarjuna Sagar

4 · Prakasam Barrage
At Vijayawada; then the delta

Right-bank tributary: Tungabhadra.
Left-bank tributary: Munneru.

India-WRIS Krishna; AP Water Resources project descriptions

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DAY 5 · TOPIC 45 · 04

Somasila is on Penna, even when water is imported



Interpretive illustration · not a site photograph

Penna river

Mid Pennar
↓
Gandikota
↓
Mylavaram
↓
Somasila

Telugu Ganga

Srisailam (Krishna)
↓
Somasila (Penna)
↓
Kandaleru
↓
Poondi, near Chennai

> Name a project by the river it stands on, not only by the source of transferred water.

India-WRIS Pennar; SPS Nellore Somasila

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DAY 5 · TOPIC 45 · 05

Vamsadhara: Odisha to Kalingapatnam

- **Origin**
  Near Lanjigarh, Kalahandi, Odisha
- **AP entry**
  Bhamini mandal, Parvathipuram Manyam
- **Lower course**
  Hiramandalam → Mukhalingam
- **Project / tributary**
  Gotta Barrage; Mahendratanaya joins upstream
- **Sea mouth**
  Kalingapatnam, Srikakulam

> CWC length: about 254 km.
> Hiramandalam: planned capacity 19.05 TMC, not a daily water-storage reading.

CWC Vamsadhara basin; Manyam district; AP Budget 2016–17

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DAY 5 · TOPIC 45 · 06

Do not swap the two northern river mouths

Vamsadhara

254 km

Gotta Barrage

Kalingapatnam
mouth in Srikakulam

Nagavali

256 km

Thotapalli Barrage

Kallepalli
near Srikakulam town



Interpretive illustration · not a site photograph

> Both originate in Odisha.
> Both ultimately enter the Bay of Bengal.

CWC Vamsadhara and Nagavali basin yearbook

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DAY 5 · TOPIC 45 · 07

Polavaram project and district are different

Name	Correct location / meaning
Polavaram Project	Polavaram mandal, Eluru district
Polavaram district	Headquarters: Rampachodavaram; hill country upstream
Markapuram district	New district with Markapuram headquarters

> **District count**
> 13 →26 on 4 April 2022
> 26 →28 on 31 December 2025

Use the district map for the relevant date, rather than old undivided-district names.

Official ASR district history; Markapuram Gazette 30 Dec 2025; Eluru mandal list

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DAY 5 · TOPIC 45 · 08

Left and right banks follow the direction of flow

Face downstream →



River	Left bank	Right bank
Godavari	Sabari	Manjira
Krishna	Munneru	Tungabhadra
Penna	Kunderu	Chitravati

India-WRIS Godavari, Krishna and Pennar; downstream-facing bank convention

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56 • 1/8

Seasonal winds change with the seasons

Heating, pressure belts and wind belts shift seasonally

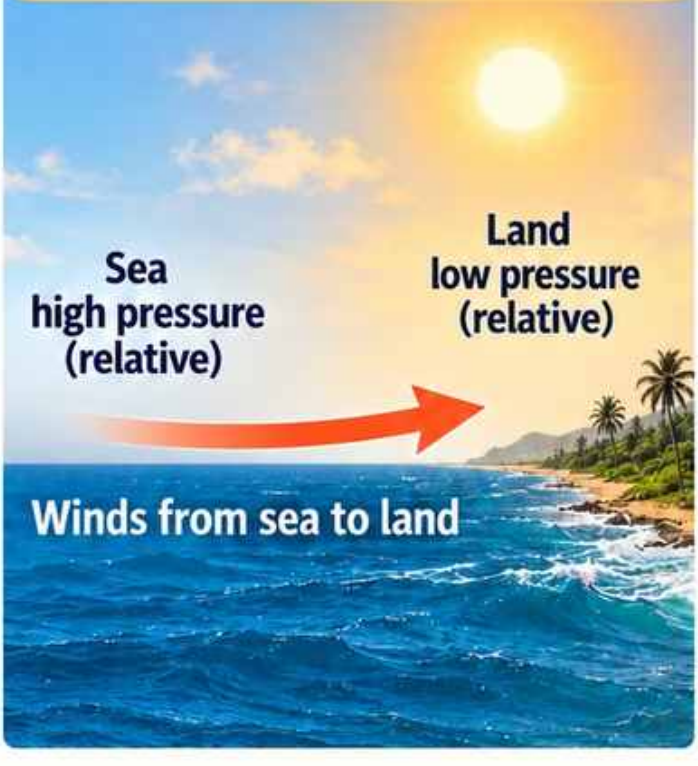
Monsoon means seasonal reversal of wind direction

Monsoon is a wind system, not a synonym for rain

North-east monsoon can bring rain after crossing the Bay of Bengal

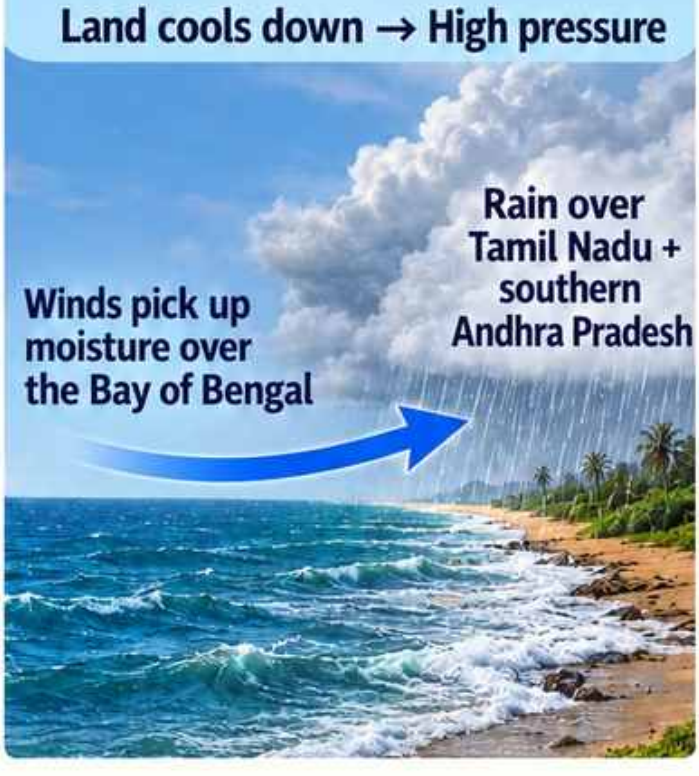
Summer (June–September)

Land heats up → Low pressure



Northeast monsoon

Land cools down → High pressure



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DAY 6 | TOPIC 56 | 1/8

56 • 2/8 Sea by day, land by night

Day: land heats faster → low pressure over land

Sea breeze: sea → land



Night: land cools faster

Land breeze: land → sea



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DAY 6 | TOPIC 56 | 2/8

56 • 3/8

Valley by day, mountain by night

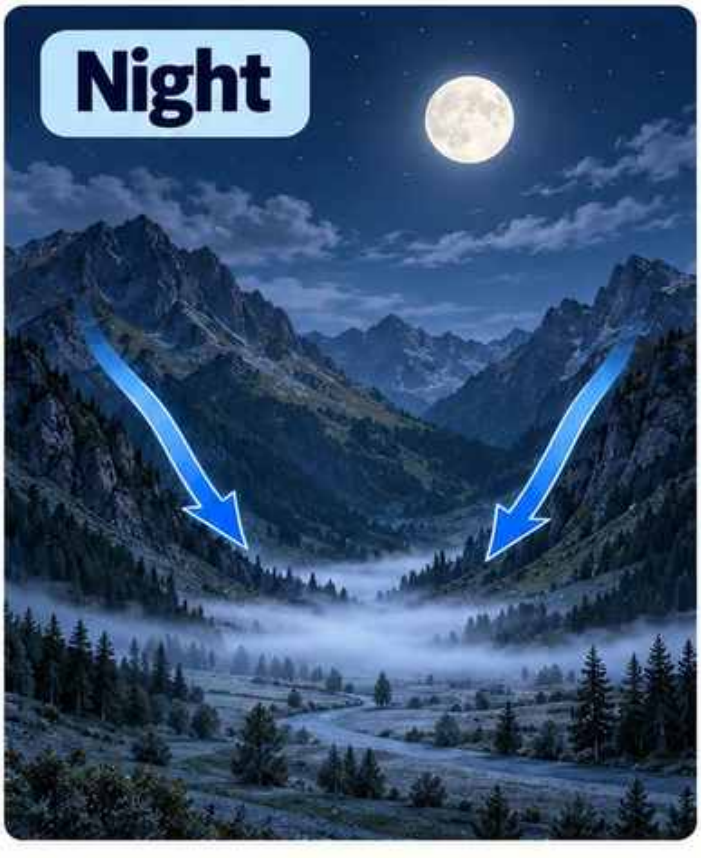
Day: heated slopes → upslope valley breeze

Night: cooled dense air → downslope mountain wind

Katabatic: cold dense air drains downhill under gravity

Cold air may collect in the valley bottom





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DAY 6 | TOPIC 56 | 3/8

56 • 4/8

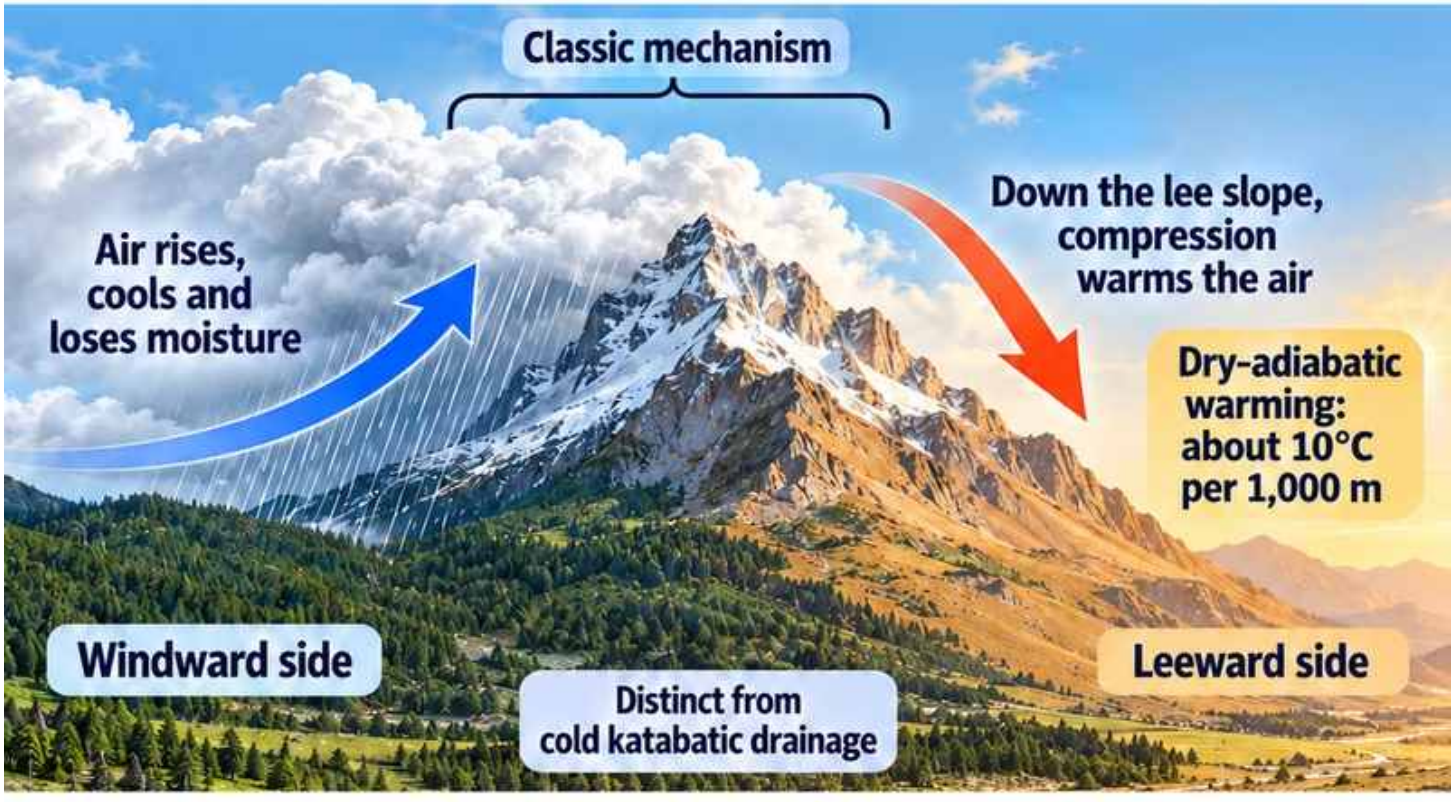
Foehn: warm air on the lee side

Classic mechanism: air rises, cools and loses moisture

Down the lee slope, compression warms the air

Dry-adiabatic warming: about 10°C per 1,000 m

Some foehn events occur without precipitation

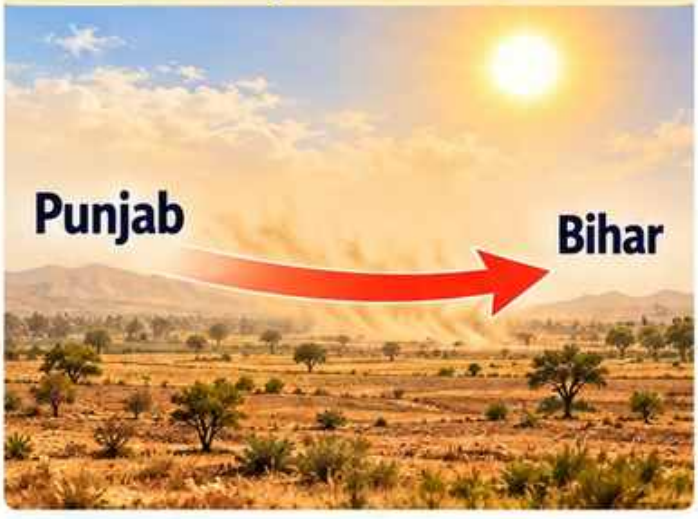


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DAY 6 | TOPIC 56 | 4/8

56 • 5/8 India and African desert winds

Loo: hot, dry summer wind, Punjab to Bihar



Harmattan: dry, dusty NE/E wind across West Africa



Sirocco: Sahara → Mediterranean → southern Europe; gains moisture



Khamsin: hot dusty southerly wind over Egypt and nearby seas



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DAY 6 | TOPIC 56 | 5/8

56 • 6/8 Three European wind routes

Foehn: warm, dry lee slopes of the Alps



Mistral: cold, dry; Rhône valley → Gulf of Lion



Bora: cold, gusty; Dinaric Alps → Adriatic



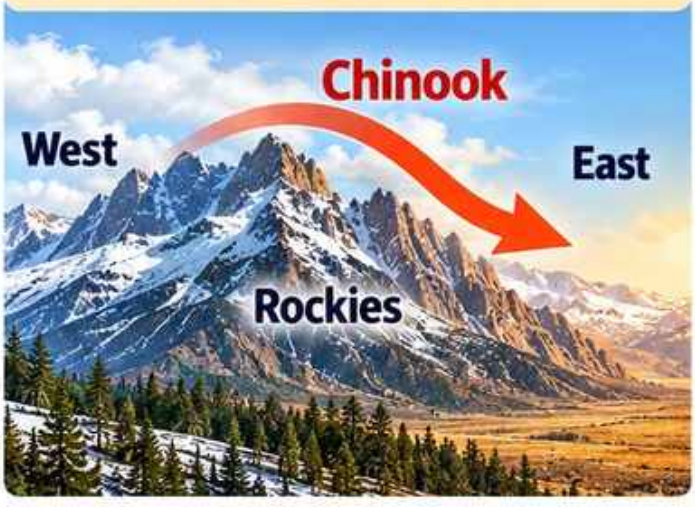
Mistral and bora are strongest or most common in winter

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DAY 6 | TOPIC 56 | 6/8

56 • 7/8 Local winds of the Americas

Chinook: warm, dry; east of the Rockies



Santa Ana: hot, dry NE/E wind in southern California; fire risk



Zonda: dry foehn on the eastern Andes, Argentina



Pampero: Argentina–Uruguay cold-front squalls; southerly shift



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DAY 6 | TOPIC 56 | 7/8

56 • 8/8 Names, effects and exam traps

Chinook: "snow eater"; melts or sublimates snow



Harmattan: "doctor" on the Guinea coast, yet dry and dusty



Loma, 1972: −48°C → 9°C within 24 hours



A downslope wind can be cold or warm; rainfall is not the definition of monsoon



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DAY 6 | TOPIC 56 | 8/8

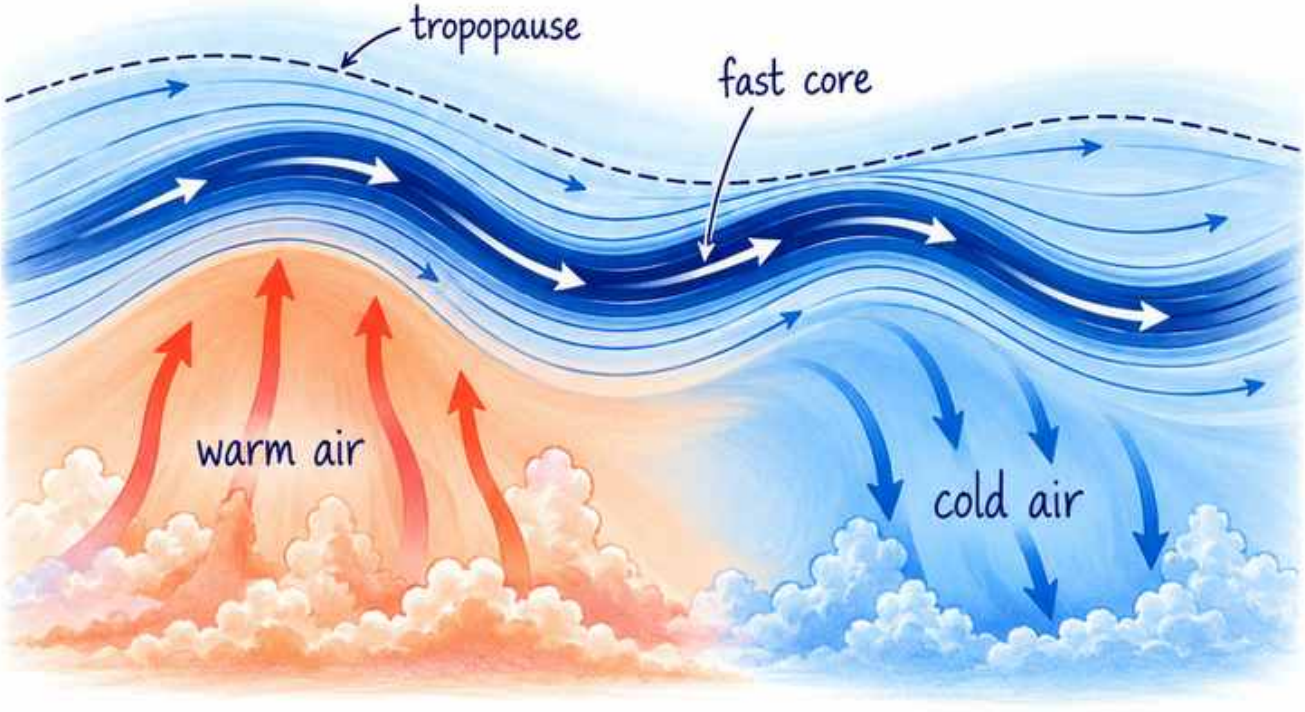
Fast rivers of air

A jet stream is a narrow band of very fast wind, usually near the top of the troposphere.

Unequal heating creates temperature and pressure contrasts.

Earth's rotation turns the moving air.

Winds strengthen toward a central core; the jet is a changing, meandering current.

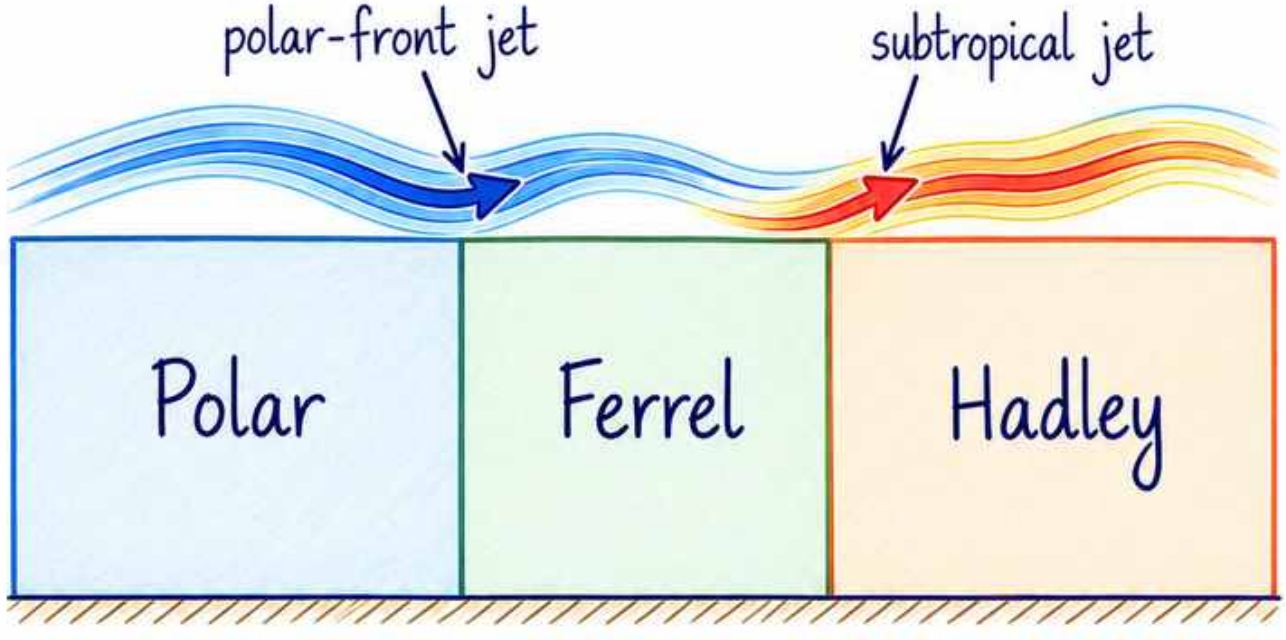


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DAY 7 | TOPIC 65 | 1/6

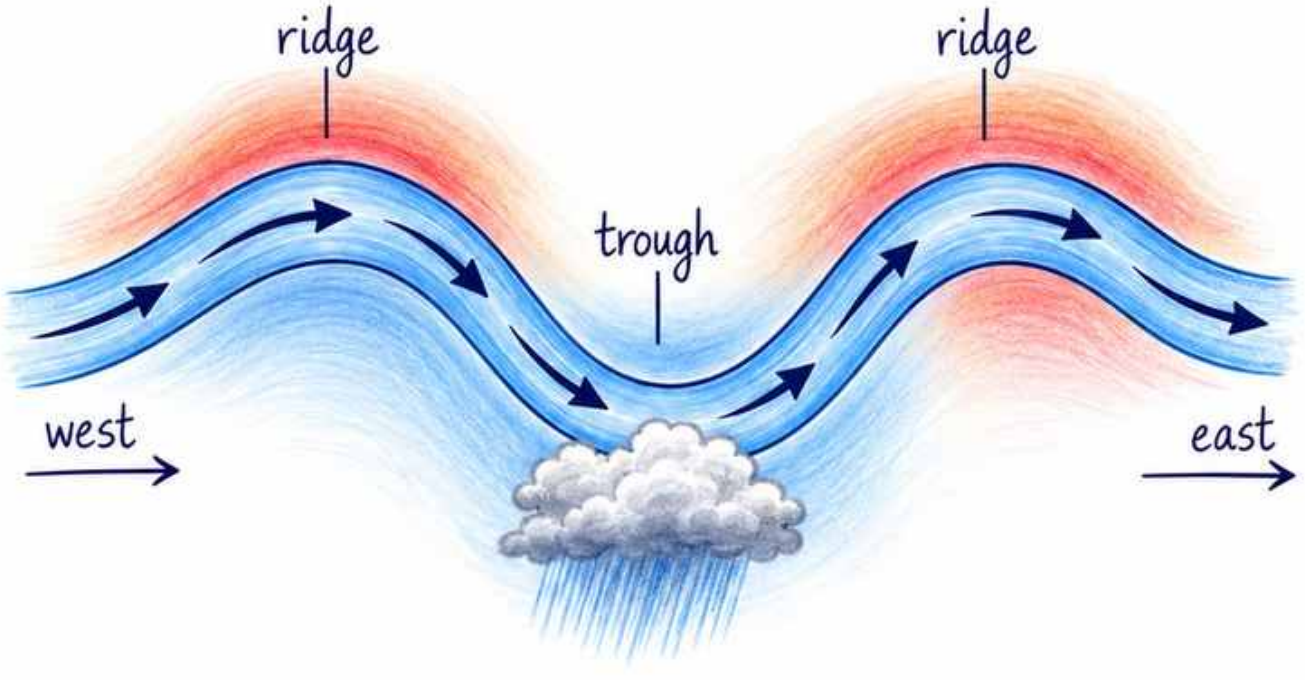
Two westerly jets

The polar-front jet is linked to the boundary between polar and warmer air. The subtropical jet lies near the poleward edge of the Hadley cell. Both generally blow west to east. Their positions vary; the principal westerly jets are usually stronger and farther equatorward in winter.



Why the jet meanders

Large planetary waves in the upper airflow are called Rossby waves. The Coriolis effect changes with latitude, allowing these waves to develop. Their bends help organise the paths of weather systems. A jet is not a fixed, unbroken ring, and its course changes from day to day.

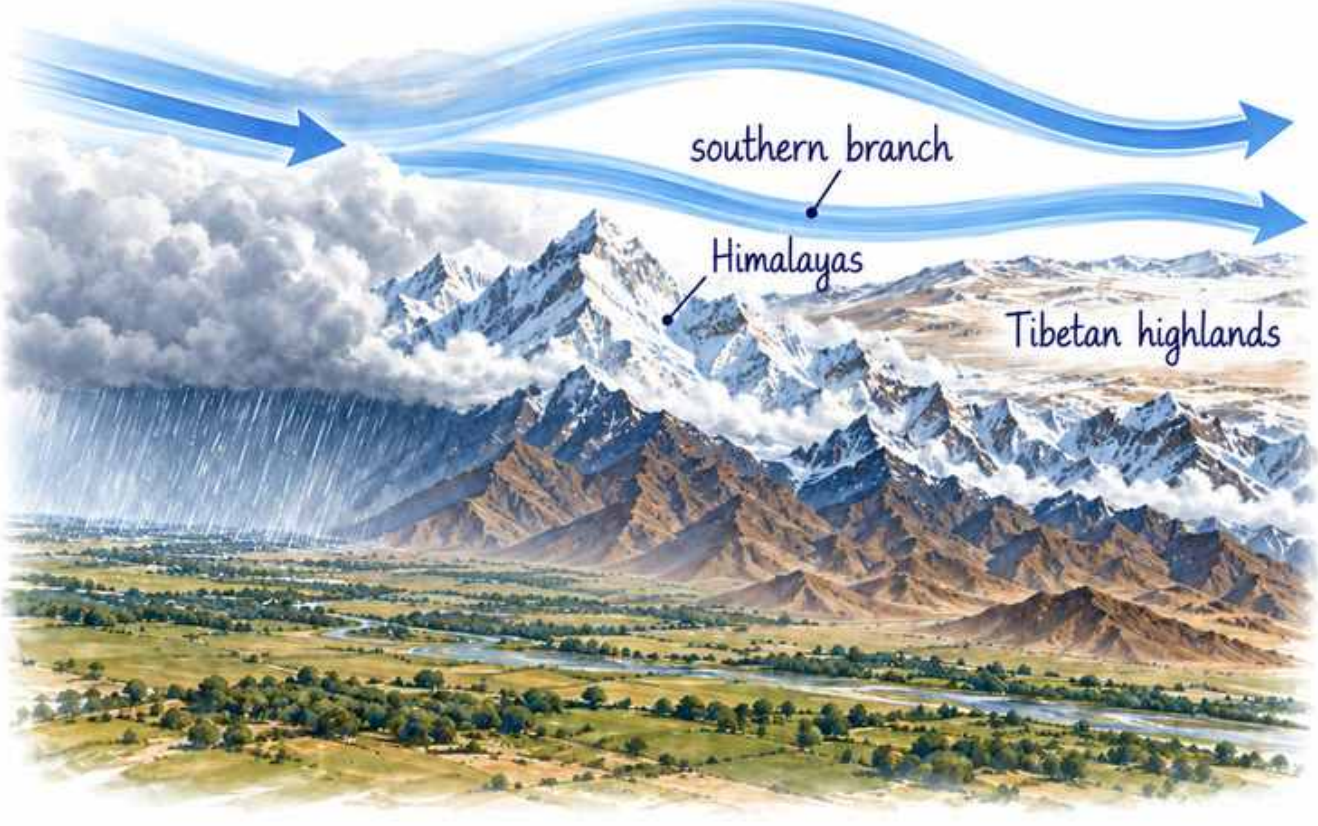


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DAY 7 | TOPIC 65 | 3/6

Winter above north India

In winter, the westerly flow splits around the Tibetan highlands. Its southern branch lies south of the Himalayas. Western disturbances travel eastward beneath this upper flow and bring winter rain and snow to north-western India. The upper-air pattern helps steer these weather systems.

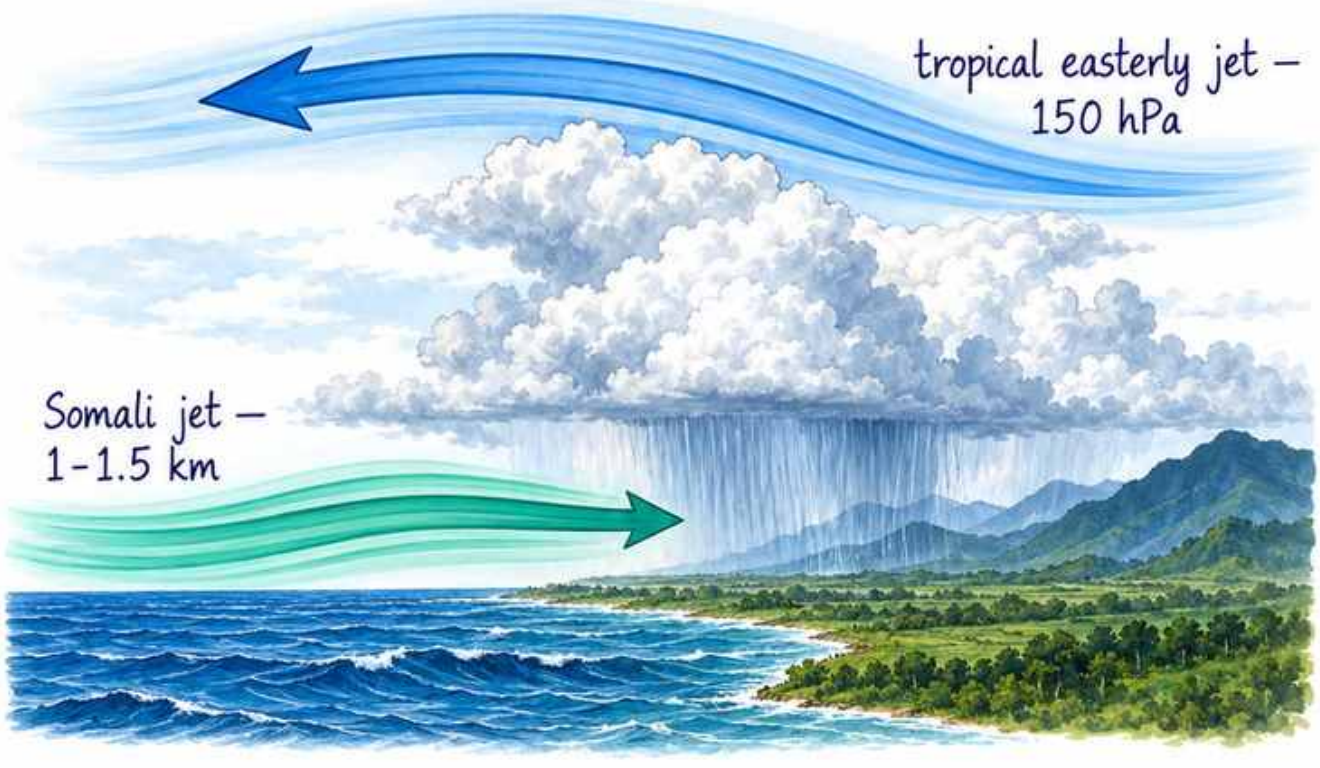


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DAY 7 | TOPIC 65 | 4/6

Two monsoon jets

In summer, the westerly jet withdraws north of the Himalayas. The tropical easterly jet develops high above the peninsula, near 150 hPa in July. Far below, the Somali jet crosses the equator at about 1-1.5 km. One is upper-level; the other is low-level.



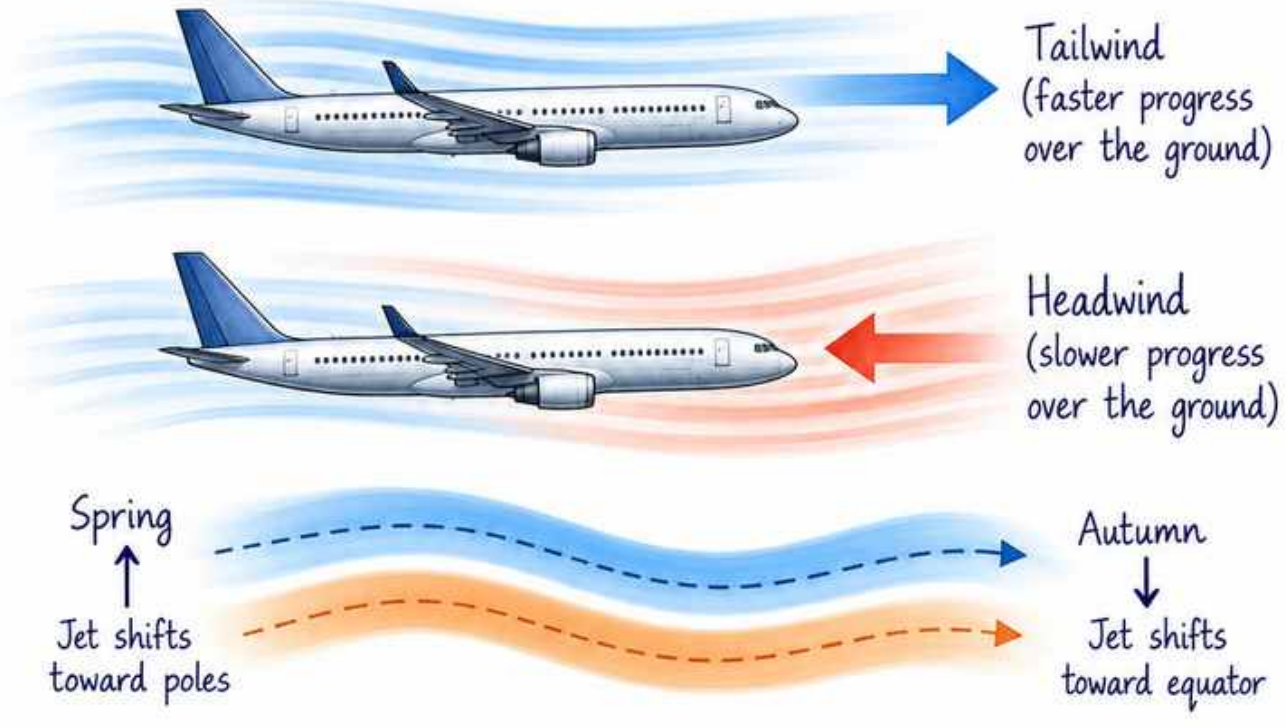
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Flights and changing seasons

The westerly jet shifts poleward in spring and equatorward in autumn. Its changing path matters for forecasts and aviation.

Aircraft can save time and fuel with a tailwind, while a headwind slows their progress over the ground. Rapid wind changes near jets can create clear-air turbulence.

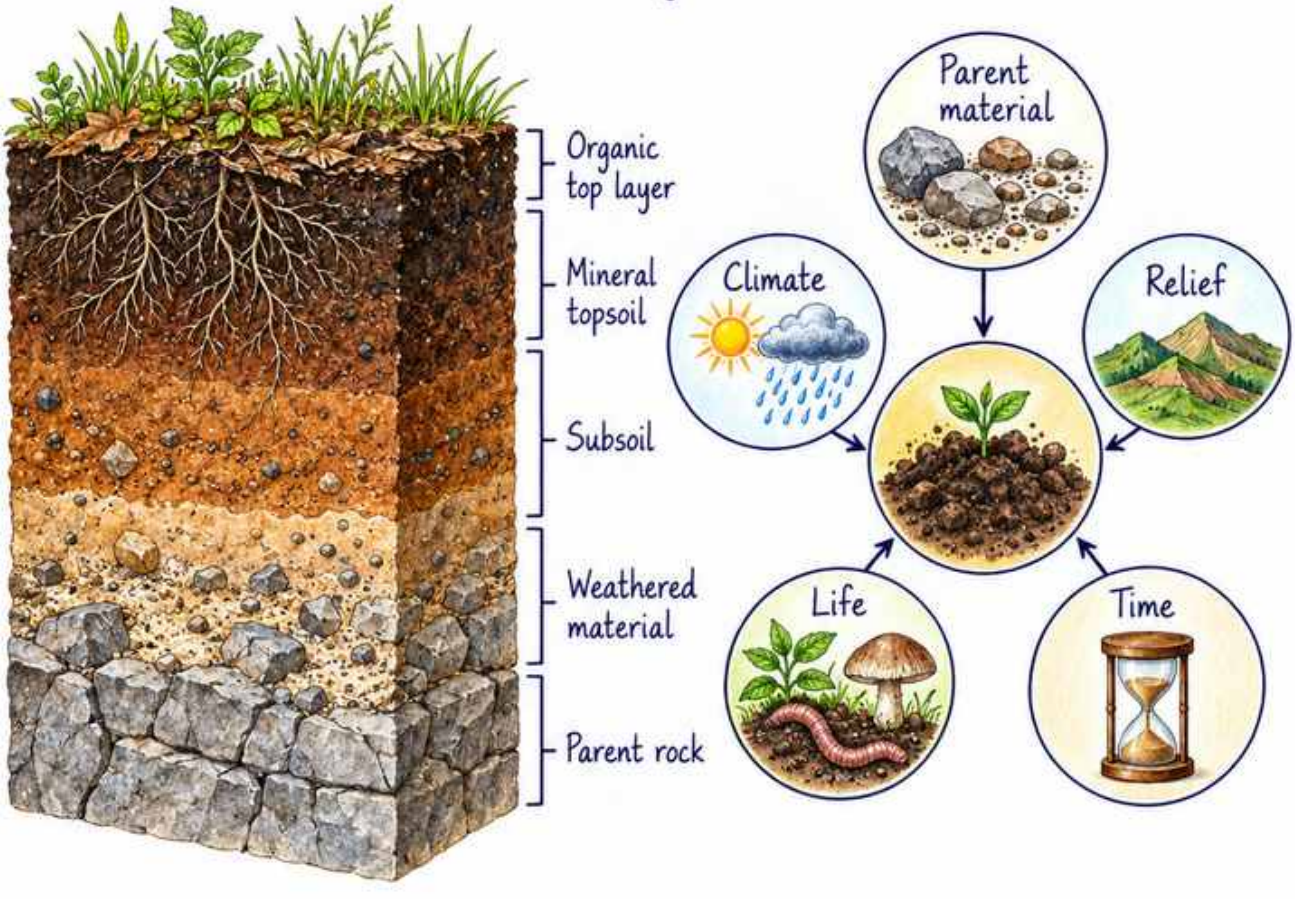


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DAY 7 | TOPIC 65 | 6/6

Soil is a living mixture

Soil develops from weathered rock and organic material.
Parent material, climate, relief, living organisms and time shape it.
A traditional grouping distinguishes eight soil groups.
USDA soil orders are a different classification, so "alluvial soil" and "Inceptisol" are not interchangeable names.



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Alluvial and black soils

Rivers deposit alluvial soils across plains and deltas.
Khadar is newer alluvium; bhangar is older.
Black soils are clayey and hold moisture well.
They swell when wet and crack when dry, producing "self-ploughing".
Dark colour alone does not mean that a soil is rich in humus.



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DAY 7 | TOPIC 66 | 2/6

Red versus laterite

Red soils gain their colour from iron compounds; hydration can give a yellow appearance.

Laterite develops under strong weathering and heavy rainfall.

Leaching removes soluble materials, leaving iron and aluminium compounds.

Soil colour, origin, nutrients and management must be considered together when judging crop suitability.



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DAY 7 | TOPIC 66 | 3/6

Four other soil settings

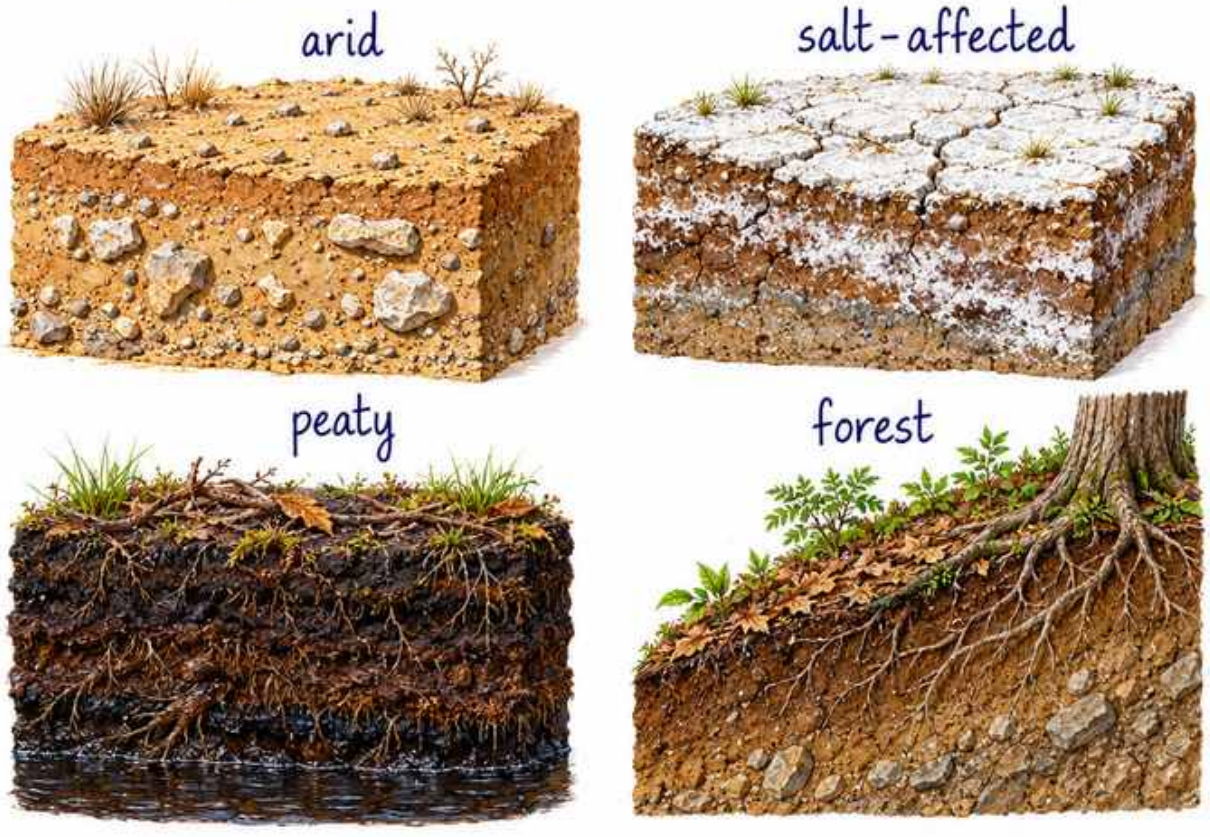
Arid soils commonly lack moisture and humus.

Salt-affected soils restrict growth and need diagnosis before treatment.

Peaty soils contain abundant organic matter.

Forest soils vary with slope and altitude.

No single description of fertility fits every soil within a broad group.



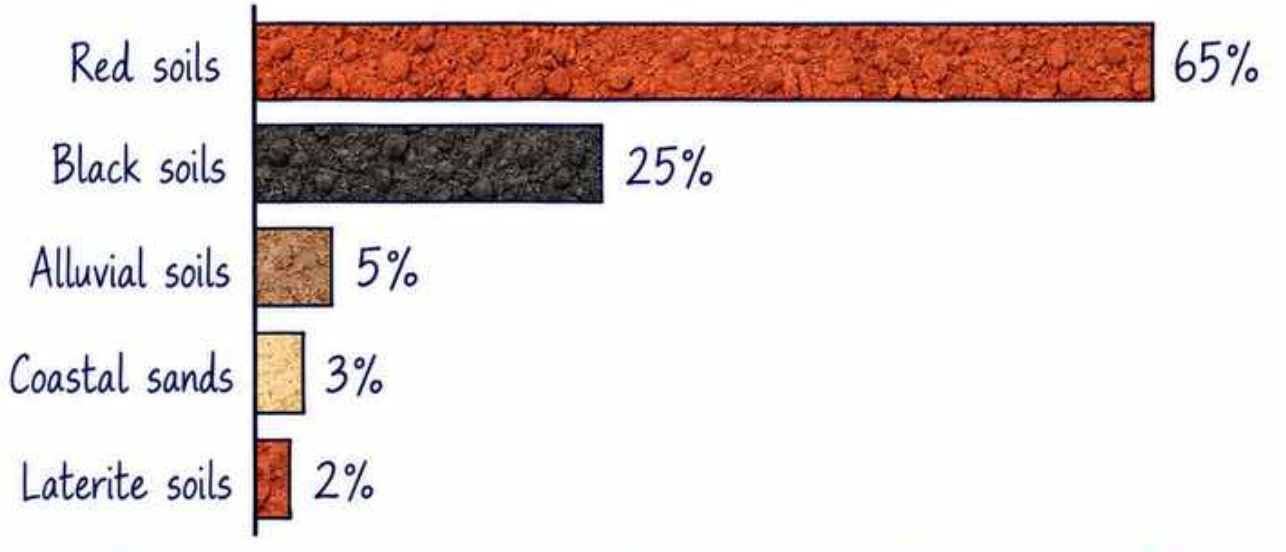
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DAY 7 | TOPIC 66 | 4/6

Andhra Pradesh: dated shares

Approximate soil-group shares in Andhra Pradesh, 2025-26: red soils 65%, black 25%, alluvial 5%, coastal sands 3% and laterite 2%. These are broad profile estimates. These groups differ from detailed soil classifications; district figures using older boundaries are not directly comparable.

Soil-group shares in Andhra Pradesh, 2025-26



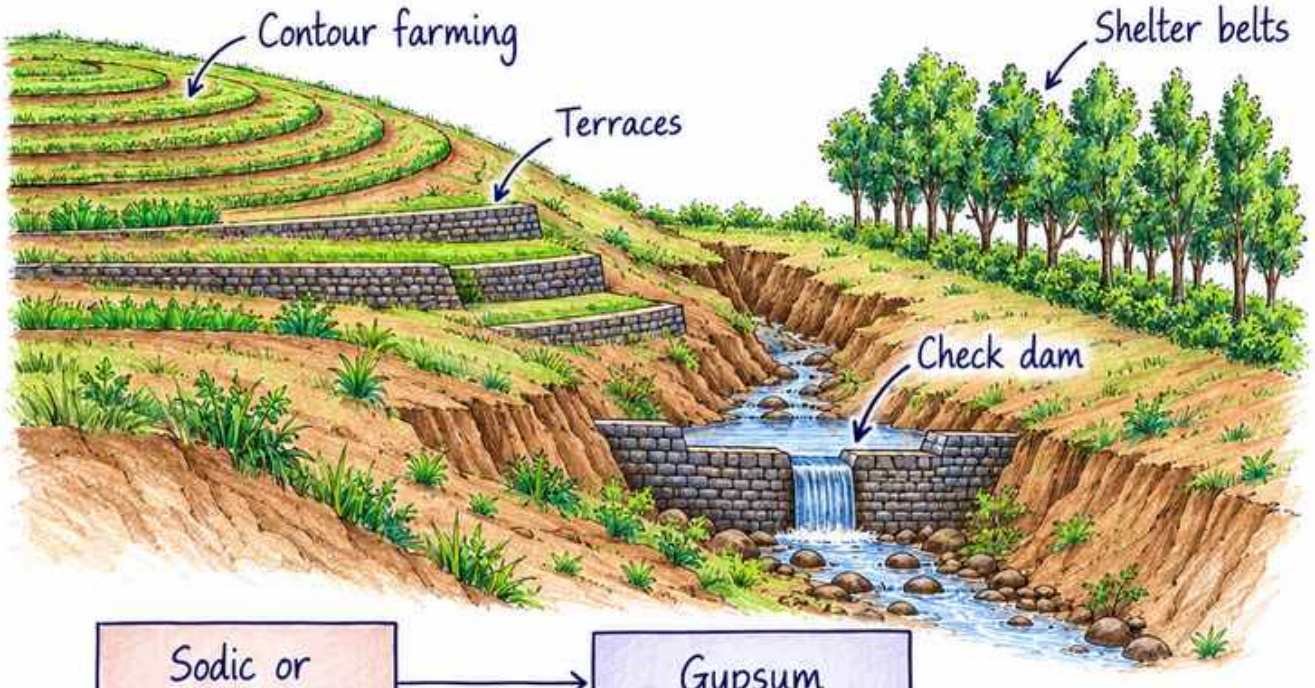


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DAY 7 | TOPIC 66 | 5/6

Match treatment to the problem

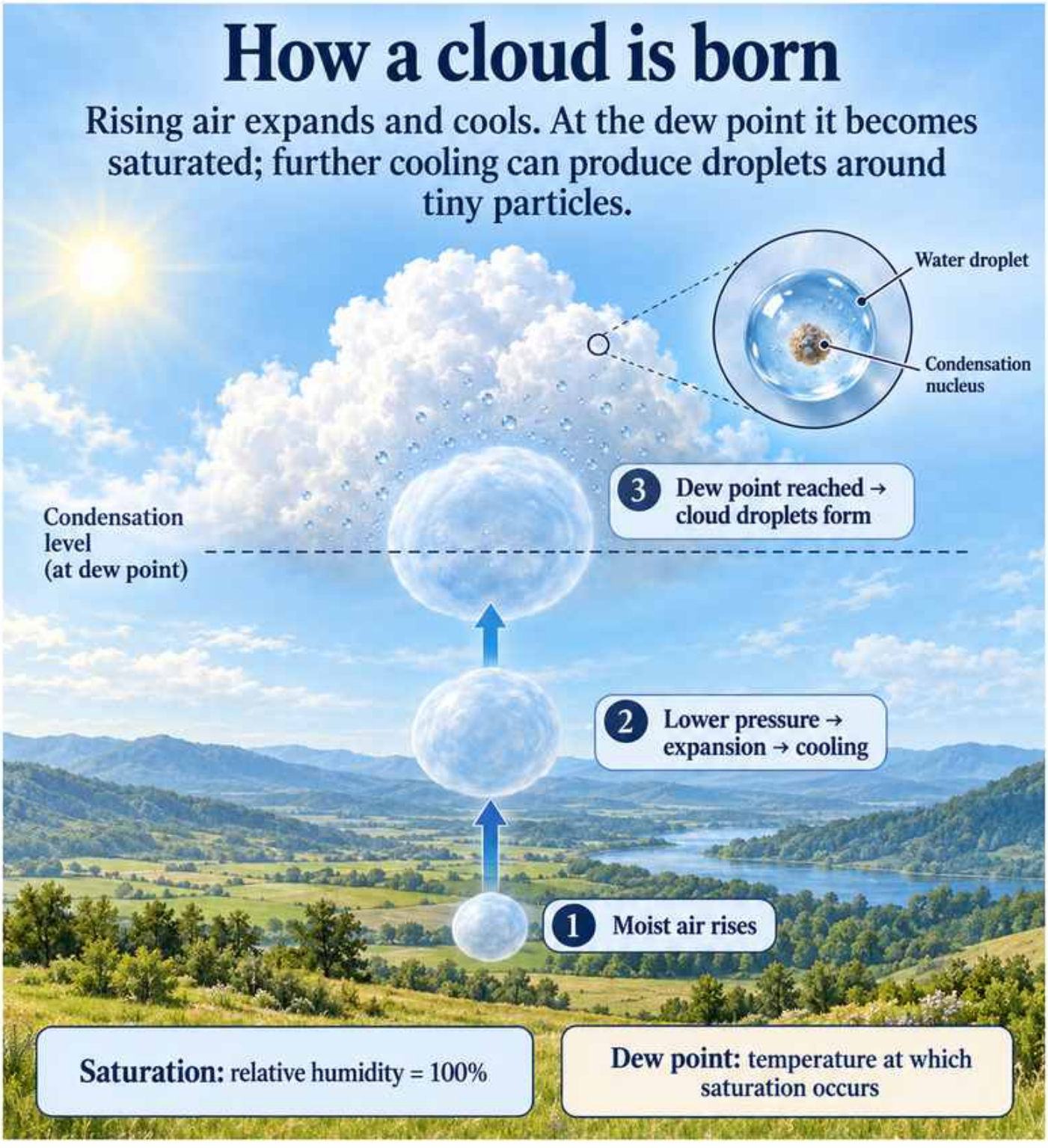
Running water causes sheet and gully erosion; wind removes loose surface soil. Contour farming, terraces, check dams and shelter belts reduce losses. For salt-affected land, gypsum chiefly treats sodic or alkali soil. Saline soil generally needs suitable drainage and leaching. Diagnosis comes before choosing a remedy.



Sodic or alkali soil	Gypsum
Saline soil	Suitable drainage and leaching

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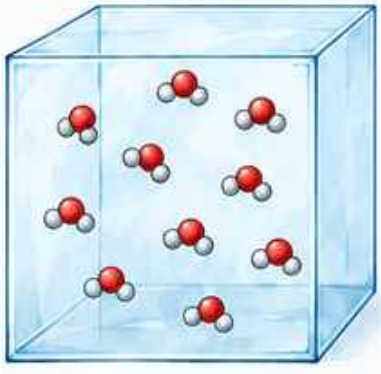
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DAY 7 | TOPIC 66 | 6/6



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DAY 8 | TOPIC 75 | 01

Humidity: three different measures

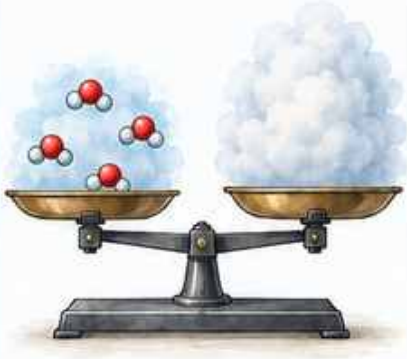
Absolute humidity



Mass of vapour per volume of air

g/m^3

Specific humidity



Mass of vapour per mass of moist air

g/kg

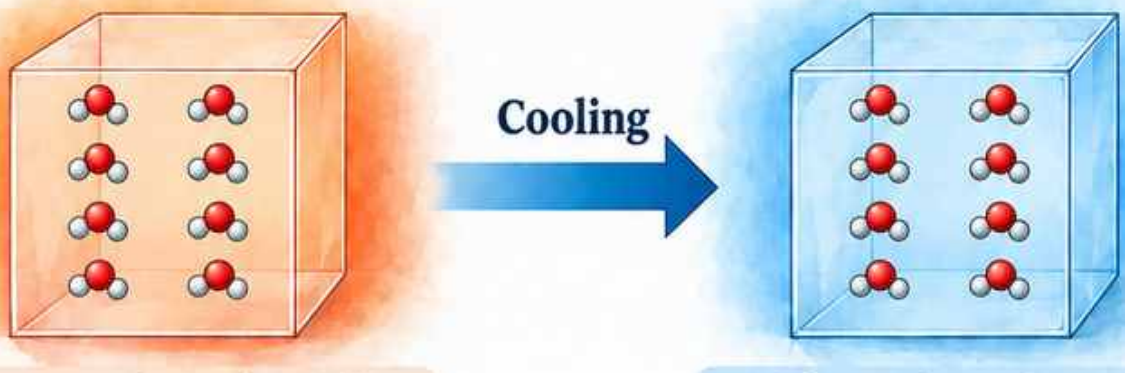
Relative humidity



Vapour present compared with saturation at the same temperature

%

Same vapour, different temperature



Lower relative humidity

Higher relative humidity

Cooling raises RH until saturation; warming lowers RH, if moisture is unchanged.

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Dew, frost, fog and mist

Dew



- Liquid water on a cool surface
- Dew point above 0°C

Frost



- Ice crystals on a freezing-cold surface
- Vapour → ice is deposition

Fog



- Cloud at or near the ground
- Visibility below 1 km

Mist



- Horizontal visibility at least 1 km

Fog and mist are suspended droplets that reduce horizontal visibility near the ground.

Dew and frost form on surfaces. Fog and mist suspend droplets in air.

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Read the clouds



Cirrus
High, thin and feathery
Ice crystals



Stratus
Layered blanket
May give drizzle



Cumulus
Cotton-like heaps
Flat base; vertical growth



Cumulonimbus
Tall thunderstorm cloud
Heavy showers, thunder or hail



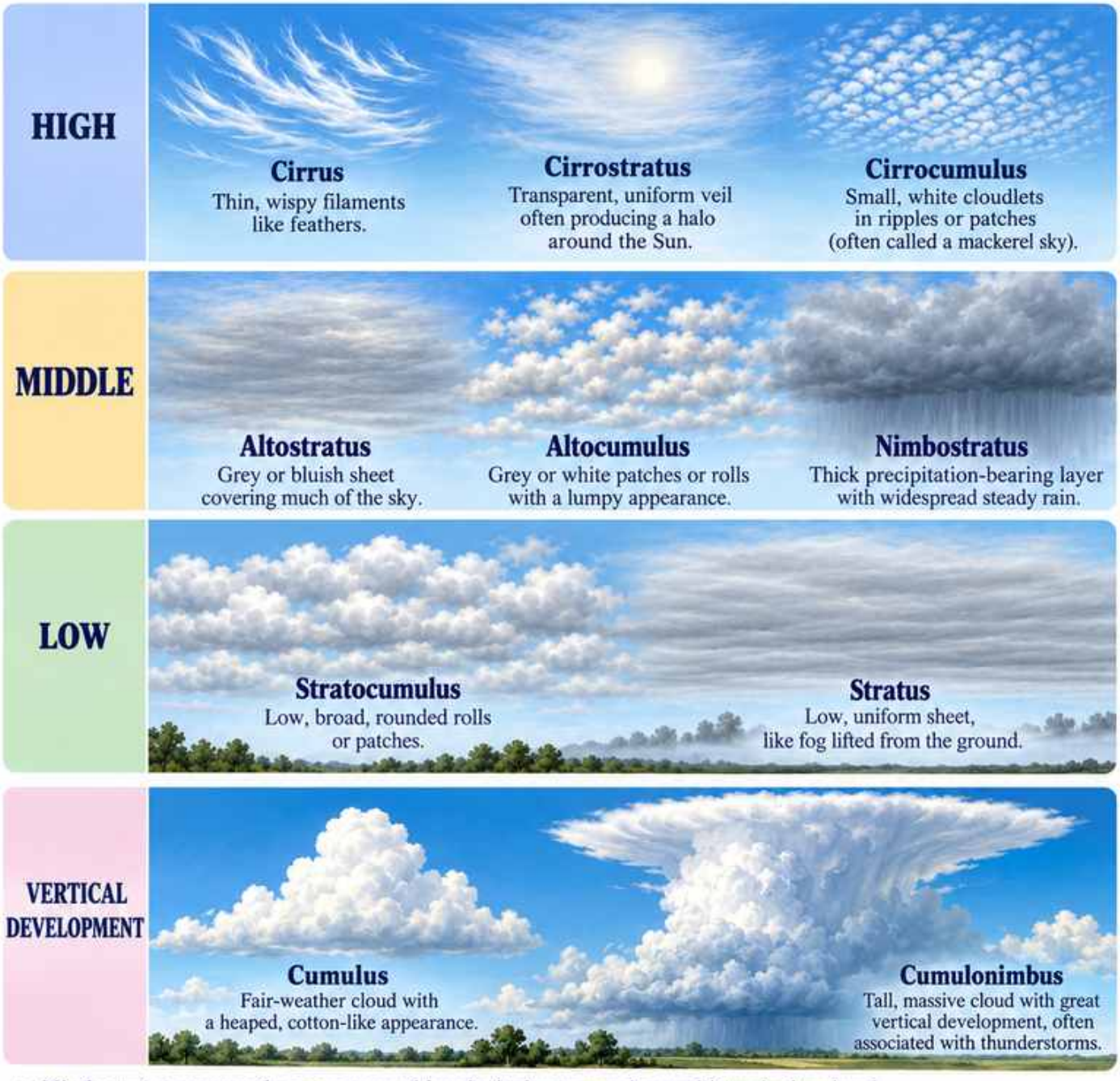
Layered rain cloud: nimbostratus → steady rain or snow

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Ten cloud genera at a glance

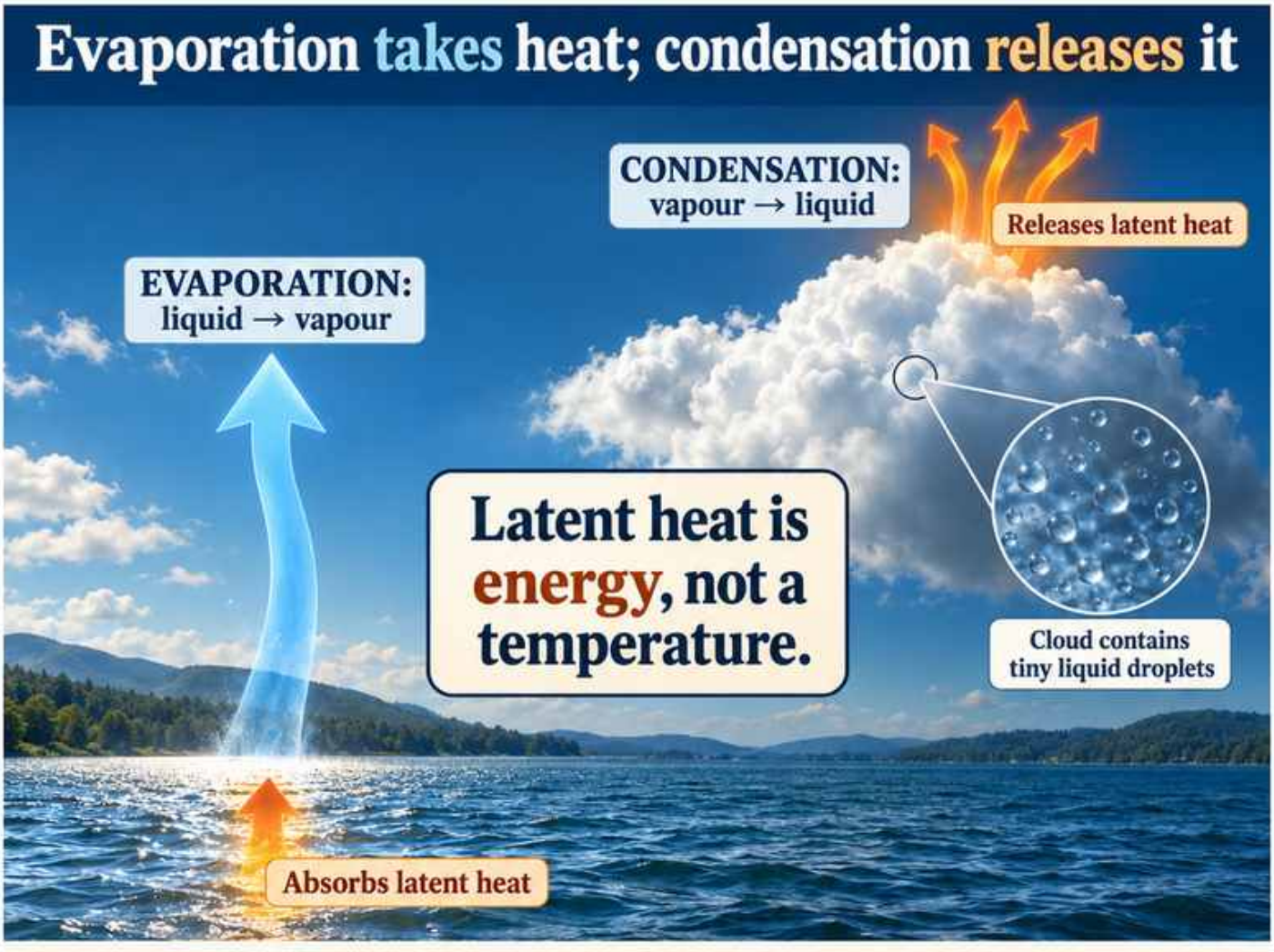
Typical levels and vertical development

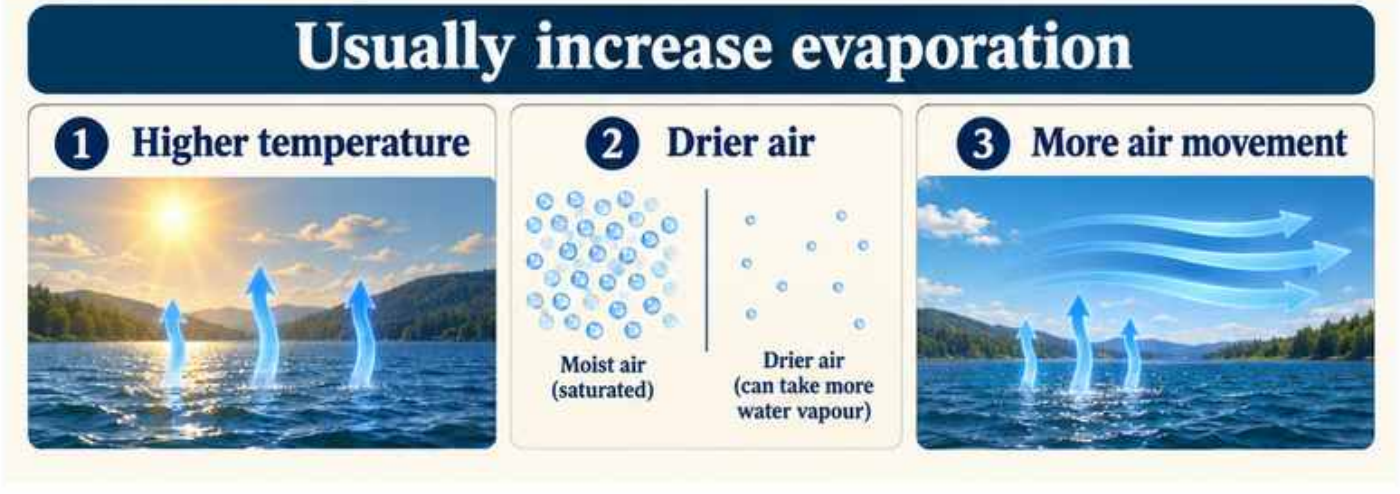


- Nimbostratus commonly spans several levels; its base may descend into the low level.
- Cumulus and cumulonimbus have low bases; their tops may reach higher levels.
- Levels overlap and vary with latitude. This grouping guide is not a height scale.

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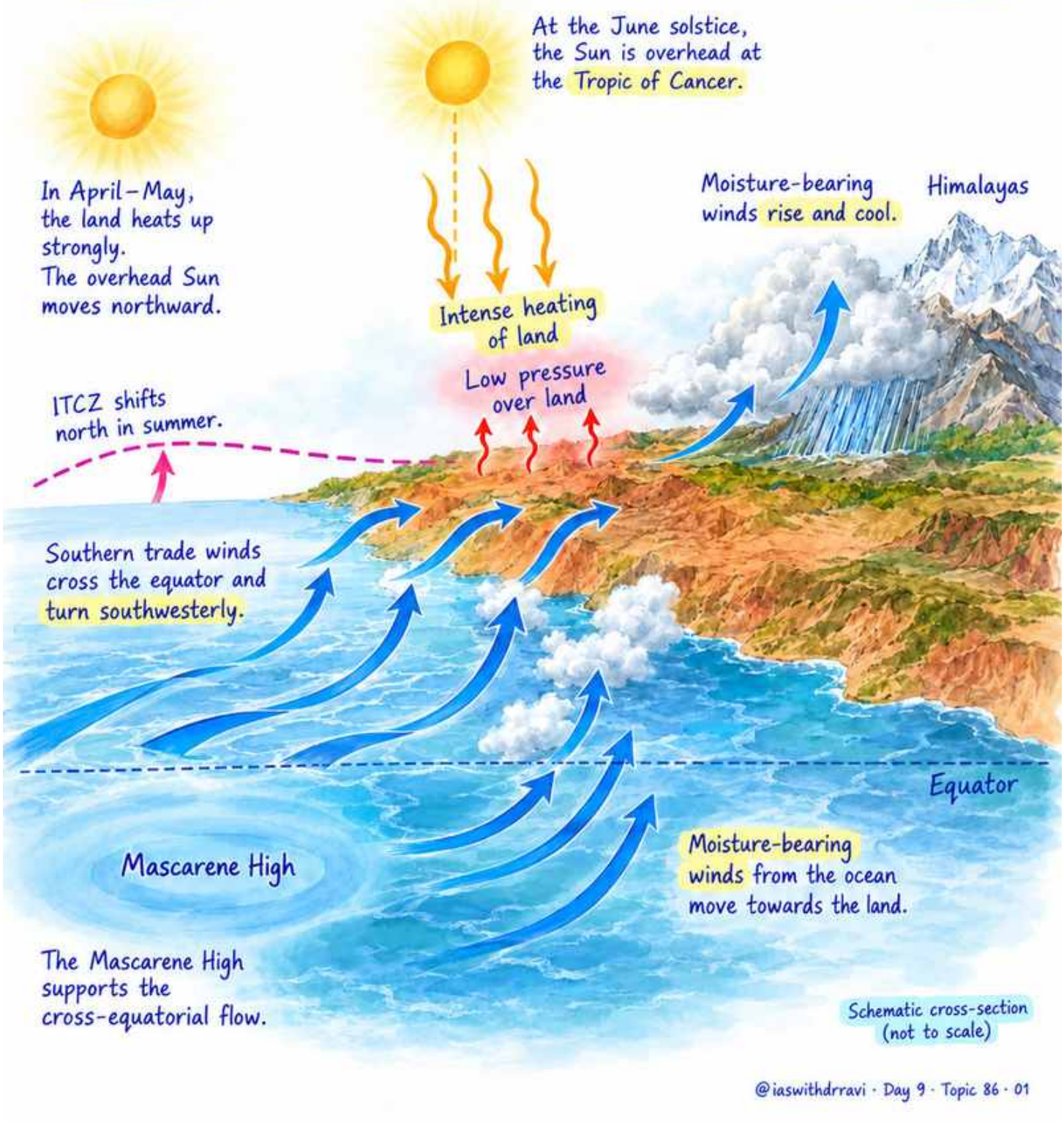


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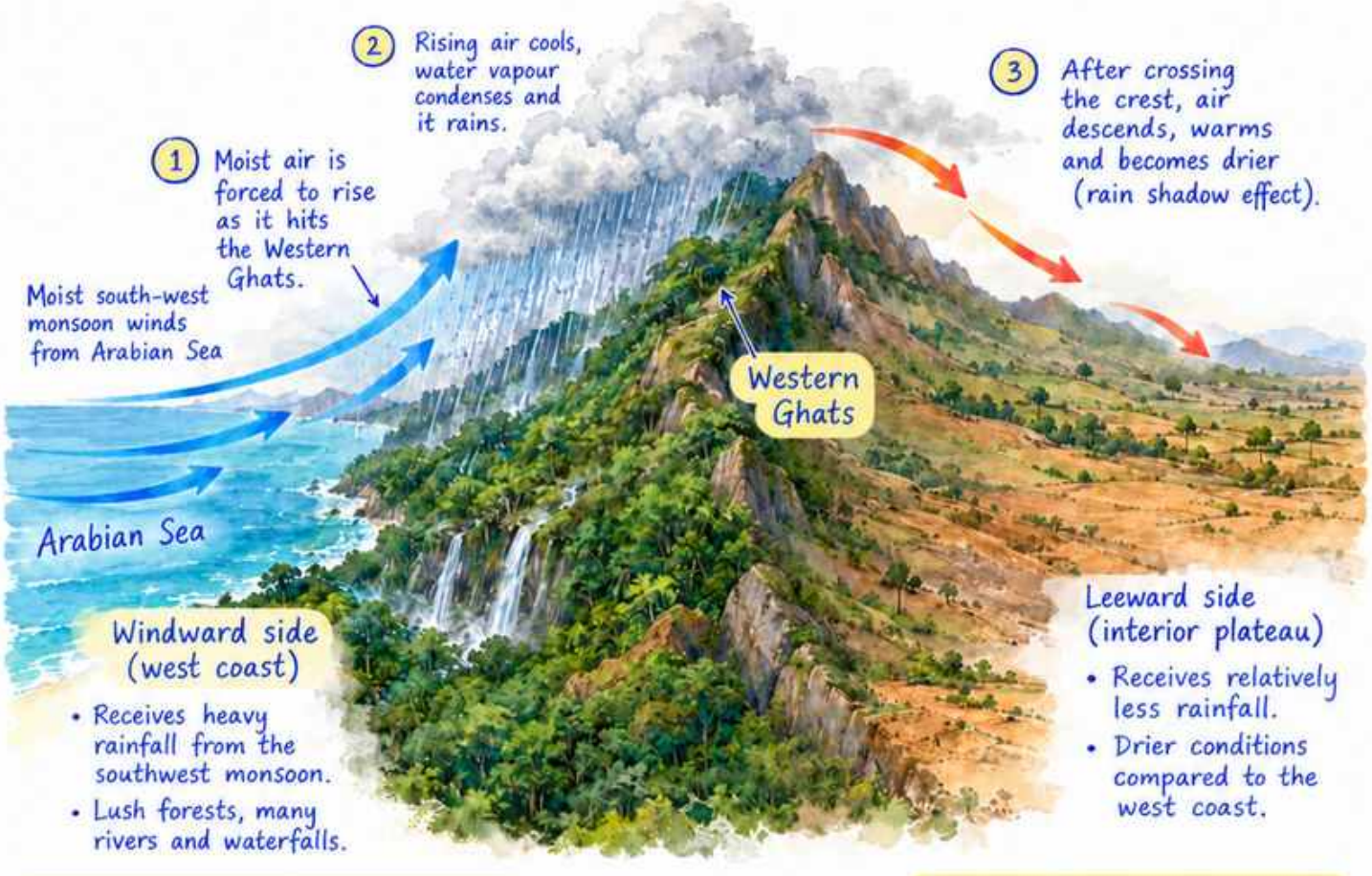
How summer draws in the monsoon



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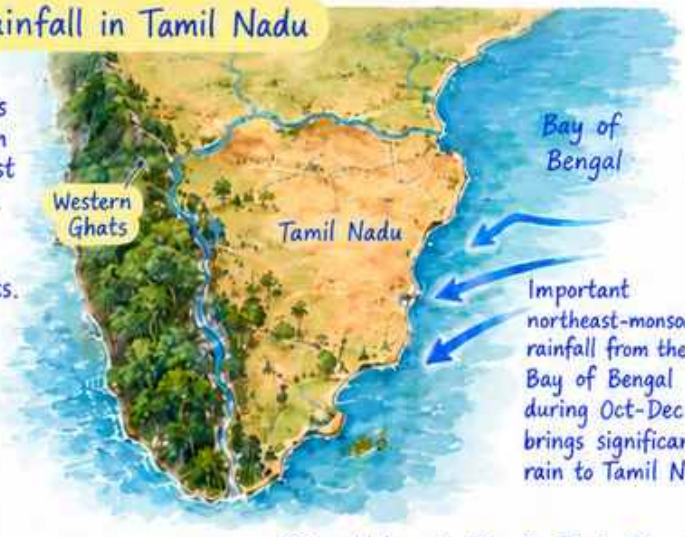
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Mountains turn moisture into rain



Different rainfall in Tamil Nadu

Tamil Nadu receives relatively less rain from the southwest monsoon because it lies in the rain shadow of the Western Ghats.



Branches of the southwest monsoon



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Onset and withdrawal: different tests

Kerala onset: tests

Rainfall condition

After 10 May, ≥60% of the available stations among 14 have ≥2.5 mm for two consecutive days.



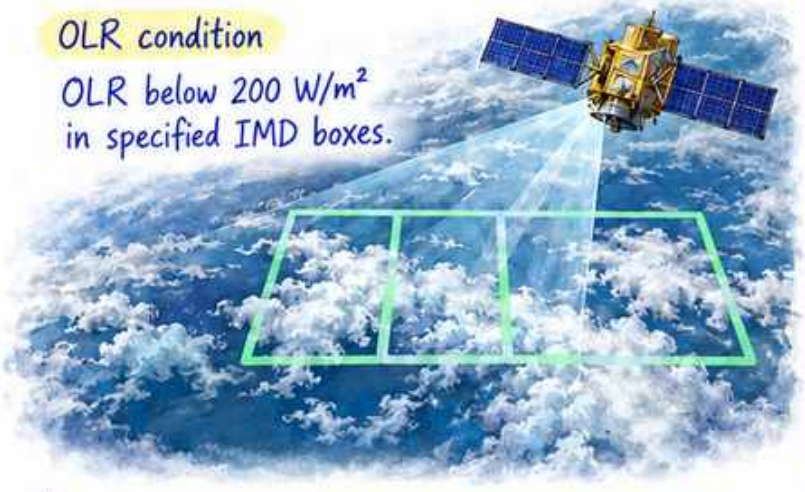
Wind condition

Westerlies to 600 hPa.



OLR condition

OLR below 200 W/m^2 in specified IMD boxes.



Withdrawal: tests

Continuous dry days

5 continuous dry days over northwest India.



Lower-troposphere anticyclone

Presence of a lower-troposphere anticyclone.



Reduced moisture

Reduced moisture over the region.



Whole-country monsoon advance

Around 8 July (normal date).



Normal withdrawal start

Around 17 September (normal date).



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Active spells, breaks and ocean signals

Active spell

- Monsoon trough over the plains
- Widespread rainfall over plains
- Heavier rain in many areas



Break

- Monsoon trough near Himalayan foothills
- Plains relatively drier
- More rain over Himalayan foothills



Pacific ocean and ENSO

Sea level pressure is measured at Tahiti (central South Pacific) and Darwin (northern Australia).

Differences between these measurements help indicate ENSO conditions.



How ocean signals influence the monsoon

El Niño phase of ENSO

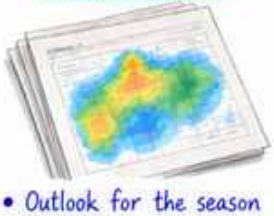
- Changes in Pacific Ocean conditions influence monsoon variability.
- Associated with a tendency towards weaker monsoon conditions, but outcomes vary from year to year.

Indian Ocean Dipole (IOD)

- Changes in Indian Ocean conditions influence monsoon variability.
- A positive IOD is associated with a tendency towards stronger monsoon conditions, but outcomes vary from year to year.

Seasonal forecast vs realised rainfall

Seasonal forecast



- Outlook for the season ahead based on ocean and atmospheric signals.
- Indicates a tendency, not a fixed outcome.

Realised rainfall



- Actual rainfall observed during the season.
- Can be higher or lower than the seasonal forecast.

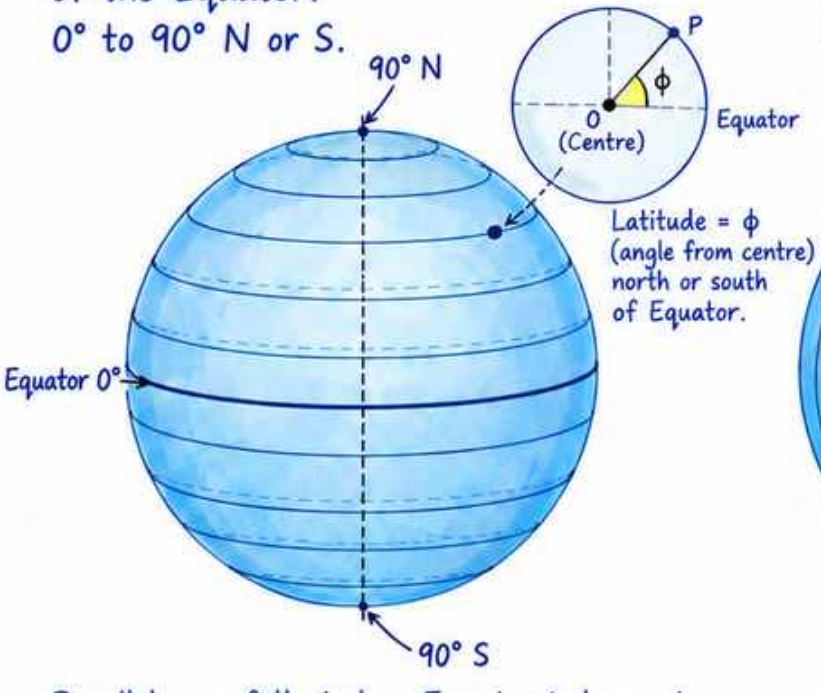
The monsoon is variable, not a single uninterrupted rain event.

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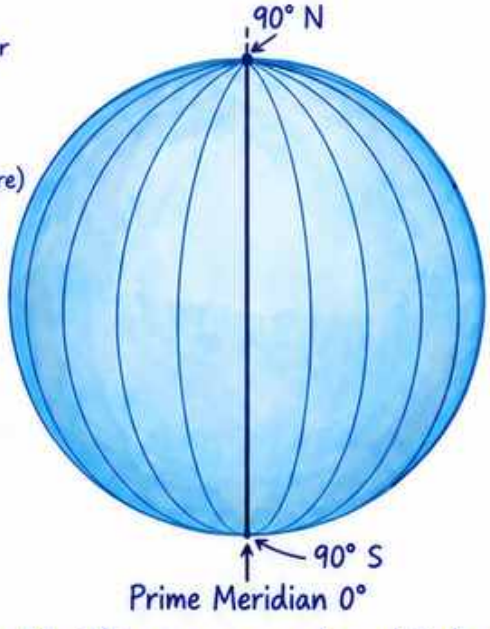
Latitude & longitude: a two-angle address

Latitude: angle north or south of the Equator.
0° to 90° N or S.



Parallels are full circles; Equator is largest; they never meet.

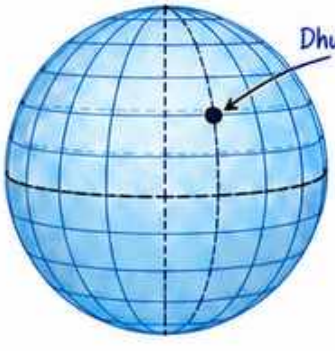
Longitude: angle east or west of the Prime Meridian.
0° to 180° E or W.

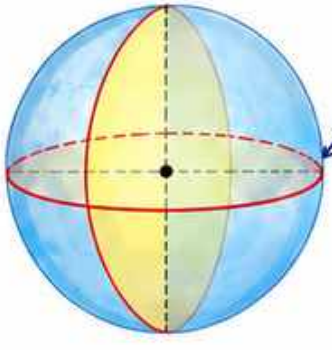


Meridians are equal semicircles; they meet at the poles.
180° E = 180° W (opposite Greenwich; on the far side).

1. 1° latitude ≈ 111 km.
2. 1° longitude ≈ 111 km at 0°, 56 km at 60°, 0 at poles.
3. Earth is slightly flattened: latitude spacing is only approximately constant.

Grid (graticule) = crossing of parallel + meridian.





Great circle: plane passes through Earth's centre.

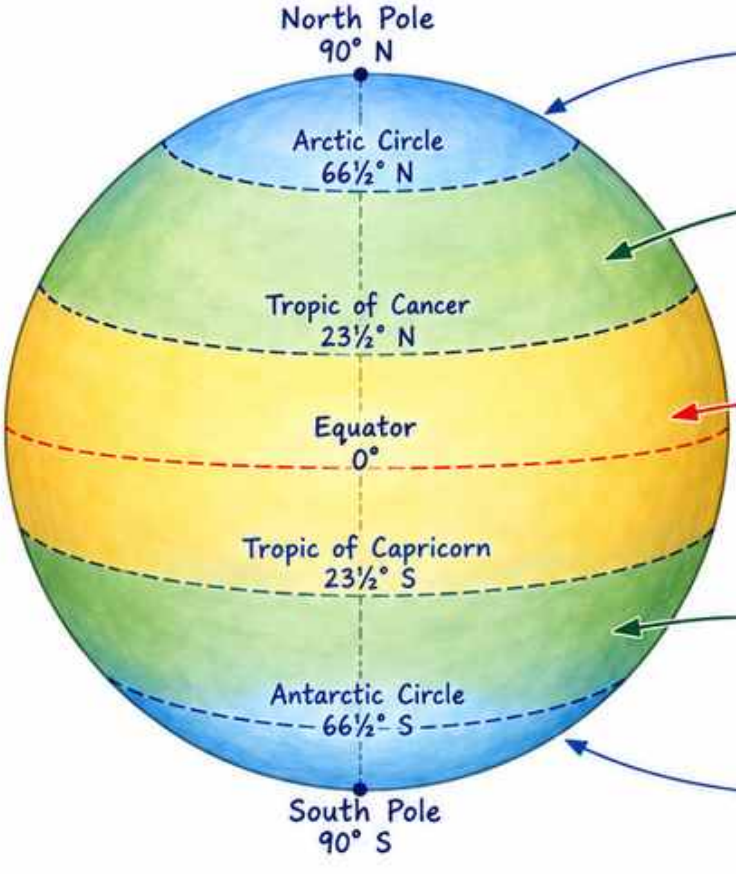
Equator, or opposite meridians together.

Shortest route on a sphere.

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Named parallels & heat zones



Two Frigid Zones:
66½° to 90° N and S.
Very oblique rays; cold.

Two Temperate Zones:
23½° to 66½° N and S.
Sun stays lower; moderate heating.

Torrid Zone:
between the tropics. Midday Sun can be overhead at least once a year.

Two Temperate Zones:
23½° to 66½° N and S.
Sun stays lower; moderate heating.

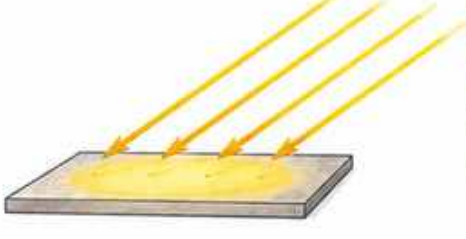
Two Frigid Zones:
66½° to 90° N and S.
Very oblique rays; cold.

Direct rays: energy concentrated



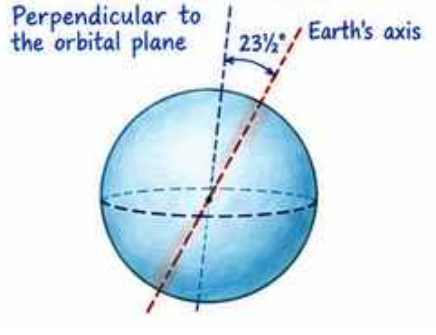
Rays nearly vertical (high angle) fall on a smaller area, so energy is concentrated and heating is stronger.

Slanting rays: energy spread over a larger area



Rays at a low angle (slanting) fall on a larger area, so the same amount of energy is spread out, resulting in weaker heating.

The latitude boundaries come from Earth's tilt



Axial tilt ≈ 23½° from the perpendicular to the orbital plane.

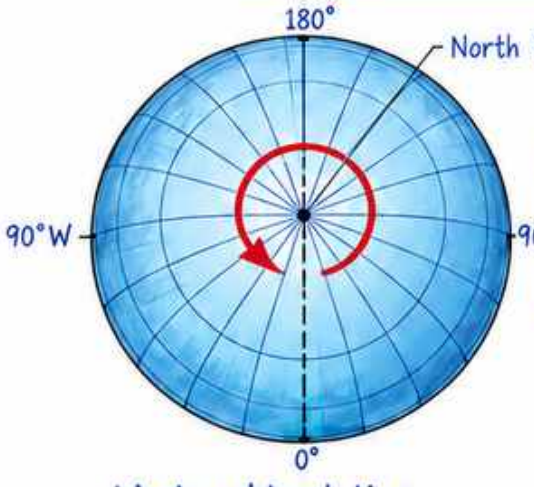
So, 90° − 23½° = 66½°, which gives the latitude of the Arctic and Antarctic Circles (66½° N and 66½° S).

23½° and 66½° are rounded values for the tropics and polar circles.

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Longitude becomes local time

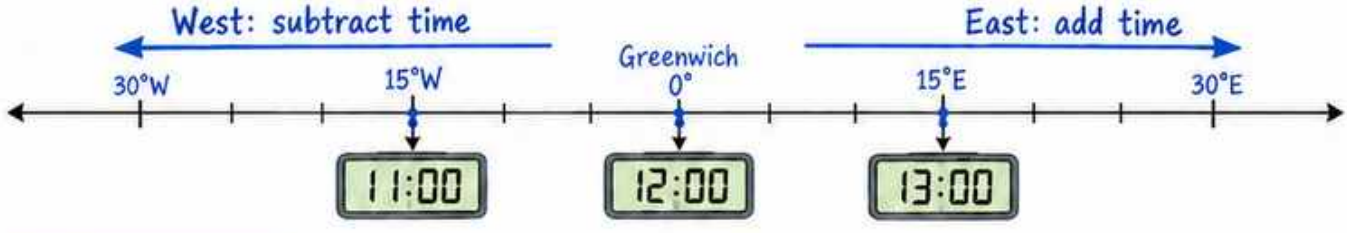


Earth rotates west → east (anticlockwise viewed from above North Pole).

360° ÷ 24 h = 15° per hour

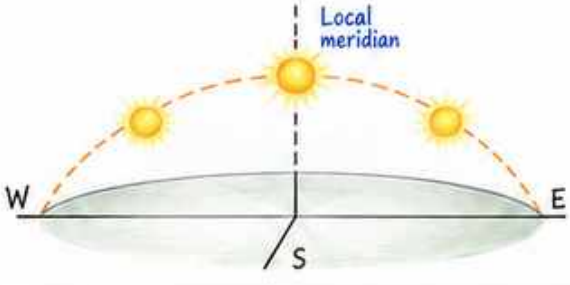
- 1° longitude = 4 minutes of time
- 15′ longitude = 1 minute of time
- 7°30′ longitude = 30 minutes of time

Here, ° = degree, ′ = arcminute of longitude, and time is in minutes or hours (h).



Local solar noon

Sun crosses the local meridian and is highest that day. Places on the same meridian share local solar time.



Local solar noon is not necessarily when the Sun is directly overhead, except at some locations on specific dates (e.g., within the tropics).

Local time varies with longitude

Different longitudes have different local times because Earth rotates eastward at about 15° per hour.

Standard time uses one selected meridian for a whole region

Clocks within a time zone show the same standard time, even though the local solar time differs slightly across the zone.

Ideal zones span 15° for one hour.

Actual legal boundaries follow countries and regions.

GMT and UTC

GMT is mean solar time at Greenwich (0° longitude). UTC is an atomic-based international time standard.
Use the stated UTC offset (e.g., UTC + 5:30).

Civil time zones can use fractional-hour offsets; 15° is the ideal model.

Examples: UTC + 5:30 (India), UTC + 5:45 (Nepal), UTC + 9:30 (Australia), etc.

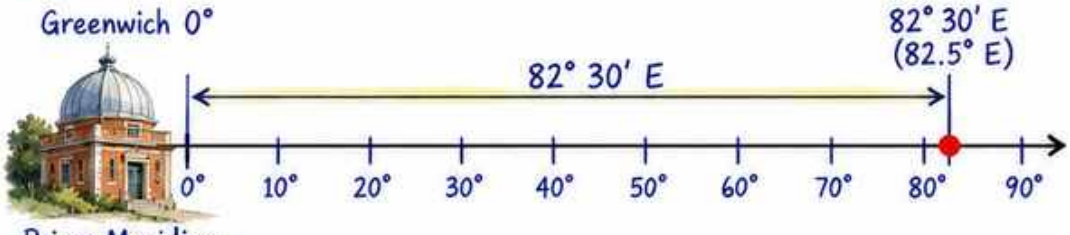
Greenwich selected internationally in 1884.
Earlier prime meridians included Ujjain's madhya rekha.

Russia: 11 zones.
Country counts depend on included territories and counting definitions.

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Indian Standard Time



Earth rotates 360° in 24 hours ⟹ 1° = 4 minutes (time)

82.5 × 4 = 330 minutes = 5 h 30 min

IST = UTC + 05:30



Standard meridian: Mirzapur, Uttar Pradesh (82°30′ E).
82°30′ E = 11 × 7°30′.



CSIR-NPL, New Delhi maintains IST using atomic clocks.

Five States, north → south (along 82°30′ E meridian)

- Uttar Pradesh
- Madhya Pradesh
- Chhattisgarh
- Odisha
- Andhra Pradesh

Tuni is near this meridian; Telangana is not on the line.

Eastern India: Sun higher



Western India: Sun lower



Illustration of local-time difference, not an observed 06:00 sunrise.

India spans about 30° longitude: nearly 2 hours of local solar-time difference, yet one official time.

Assam's tea-garden time is a local work-time convention, often IST + 1 hour; it is not a second official zone.

IST Rules, 2026: notified 27 August 2026; commence 180 days after Gazette publication.
As of 16 October 2026: notified, not yet in force.

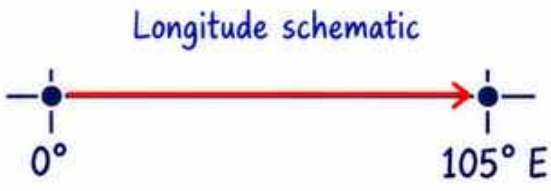
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Time calculations: show every step

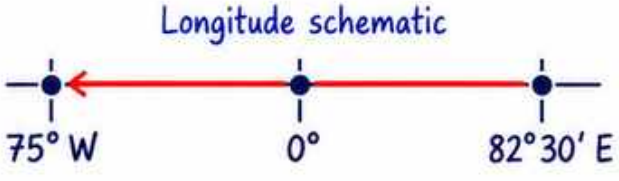
Same side of Greenwich: subtract longitudes. Opposite sides: add. Convert 1° to 4 minutes. East: add time; west: subtract. Passing midnight changes the date.

1 From Greenwich



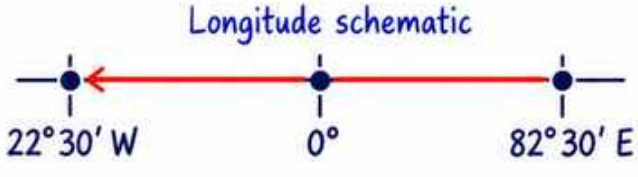
06:00 at 0°
105° ÷ 15 = 7 h east
06:00 + 7 h = 13:00

2 From IST to the west



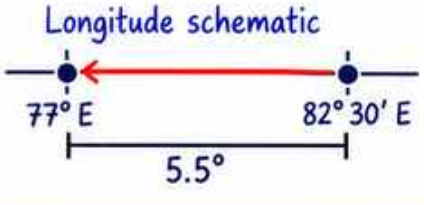
20:00 IST
82.5° + 75° = 157.5°
157.5 ÷ 15 = 10 h 30 min
20:00 − 10:30 = 09:30

3 Across midnight



04:00 IST, Friday
82.5° + 22.5° = 105° = 7 h
04:00 − 7 h = 21:00, Thursday

4 Local time differs from the watch



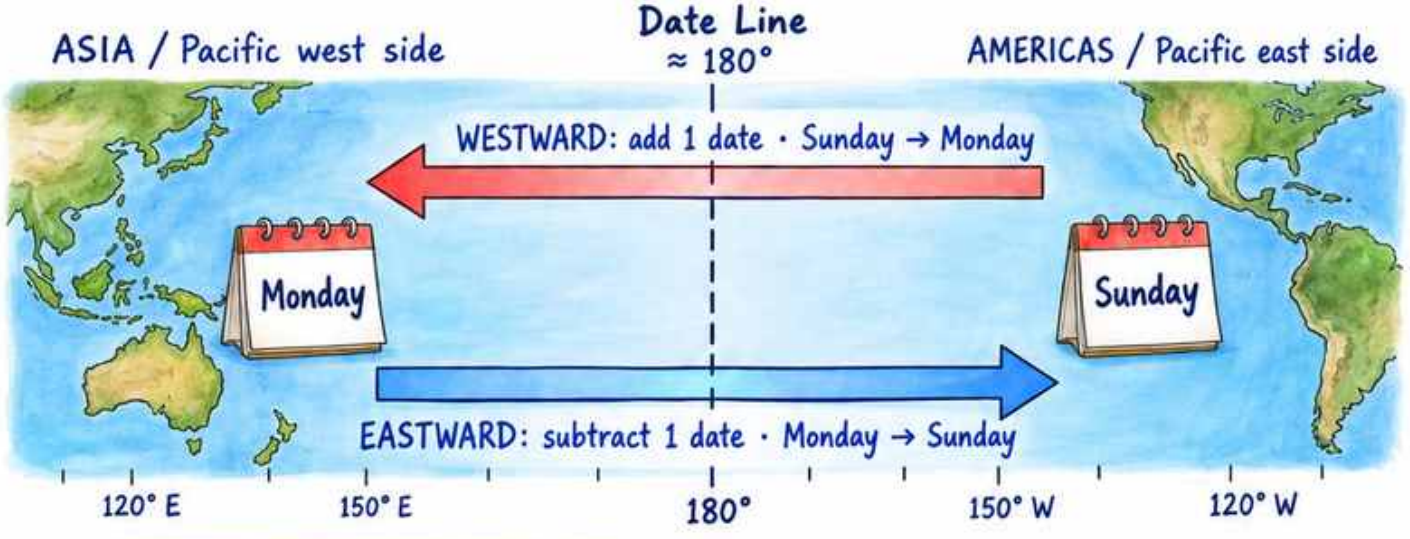
12:00 IST at 77° E
82.5° − 77° = 5.5°
5.5 × 4 = 22 minutes
Local mean solar time = 11:38; watch = 12:00 IST

These calculations use idealised local mean solar time, not each place's legal civil time.

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Crossing the International Date Line



Westward: skip a date ('lose a day')

Eastward: repeat a date ('gain a day')

Example (eastward across the Date Line)



30° east = +2 h; cross eastward = −1 date
Alternative check: 330° west = −22 h: same answer.

1. The line bends around political borders; it is not always the 180° meridian.



2. Bering Strait bend: eastward; Aleutian bend: westward. Kiribati's Line Islands use UTC+14.



3. Samoa skipped 30 December 2011; American Samoa kept the other side.



Date correction is separate from longitude calculation.
On real trips, civil clock offsets can change too.

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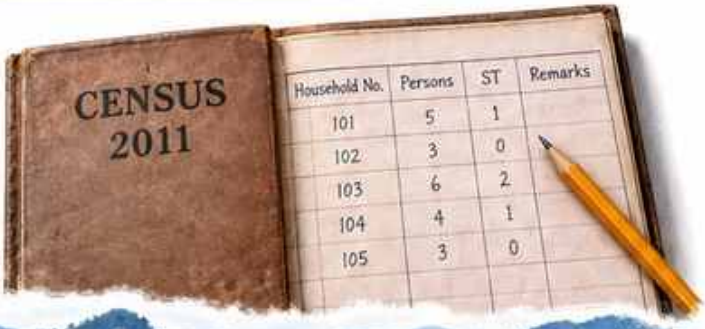
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AP tribes: read the three lists

Present Andhra Pradesh • Census 2011

1 Community

- 34 Scheduled Tribes
- 27,39,919 people • 5.53% of the State
- ST status is State-specific: Article 342



2 Place

- Scheduled Areas are notified territories
- Fifth Schedule • Article 244(1)
- A tribal settlement can lie outside a Scheduled Area

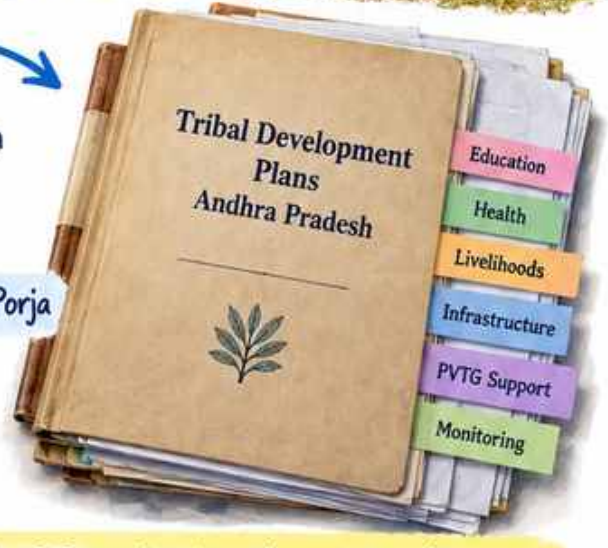


3 PVTG support

- Particularly Vulnerable Tribal Groups are within the ST category
- Six broad tribe headings:

Chenchu • Konda Reddi • Savara • Kondh • Gadaba • Porja

- Official subgroups include Konda Savara, Bodo/Gutob Gadaba, Dongria/Kutia Khond and Bondo/Khond/Parengi Porja





2011, undivided AP: 59.18 lakh STs • about 7% • 35 tribes

Do not apply undivided-State figures to today's AP

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Chenchu and Konda Reddi

Regional associations • older districts are labelled

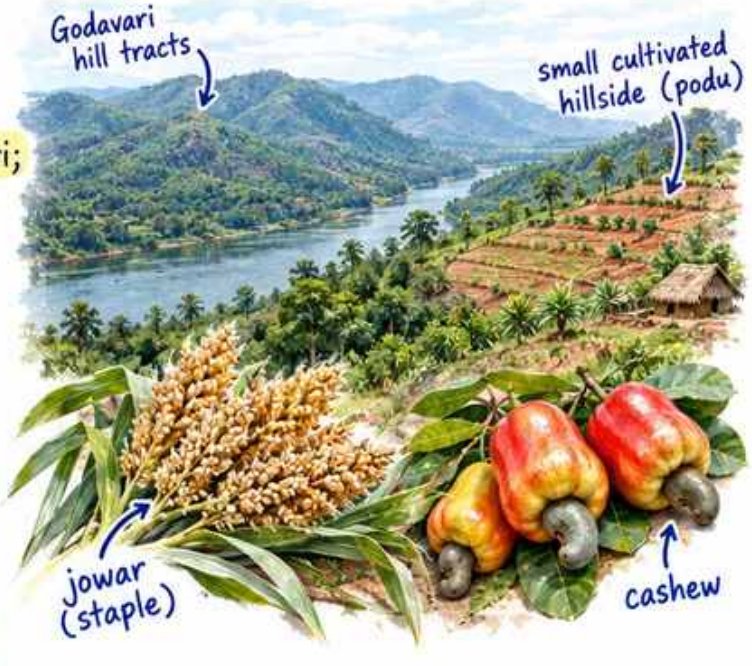
Chenchu

- Nallamala forests and Krishna gorge
- 2011 districts: Prakasam, Guntur, Kurnool
- Speech: Telugu
- Traditional forest-food gathering and honey collection; also wage work
- Settlements: gudems
- Special association with Srisailam Sivaratri
- 2011 population: 47,315



Konda Reddi

- Godavari hill tracts
- 2011 districts: East Godavari, West Godavari; some in Visakhapatnam
- Speech: Telugu
- Podu, settled farming, forest produce and cashew
- Also called Pandava Reddis
- Headman: peddakapu • staple: jowar
- 2011 population: 90,937



Podu = shifting cultivation on hill slopes

These are traditional associations; livelihoods vary and change

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Savara and Kondh

Two hill communities • distinct language and culture

Savara

- 2011 hill districts: Srikakulam and Vizianagaram
- Speech: Savara; Telugu also used
- Konda Savara: podu, horticulture, forest produce
- Kapu Savara: settled cultivation
- Features: wall painting and fruit-eating festival
- Some clan names adopted from neighbouring Jatapu
- 2011 population: 1,37,613



Kondh / Khond

- Paderu agency: eleven tribal mandals
- Old Visakhapatnam district; now Alluri Sitharama Raju
- Speech: Kui / Kuvi (Dravidian); Odia also used
- Self-names include Kuvinga and Kuidora
- Podu, forest produce and livestock
- Subgroups: Dongria Khond and Kutia Khond
- 2011 population: 1,02,378



Dravidian

Language, subgroup and livelihood are separate matching clues

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Gadaba and Porja

Eastern Ghats: speech, land and livelihoods



Gadaba

- North-coastal forest belt
- 2011 districts: Visakhapatnam, Vizianagaram, Srikakulam
- Many in the old Vizianagaram area
- Speech: Gadaba; other local languages also used
- Subgroups include Bodo Gadaba and Gutob Gadaba
- Podu, forest produce, sheep and goats
- Some plains families practise settled cultivation
- 2011 population: 37,798



Porja

- Visakhapatnam agency, especially Munchingput
- Today: Paderu hills, Alluri Sitharama Raju district
- Speech: Porja; Adivasi Odia and Telugu also used
- Podu AND terrace cultivation; forest produce
- Nature-linked clan names include Korra and Kilo
- Official PVTG names: Bondo Porja, Khond Porja, Parengi Porja
- 2011 population: 36,145



Podu = shifting fields • Terraces = stepped fields on slopes

Subgroups and language use vary within a community

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Plains communities: match the clues

Traditional associations, with changing livelihoods

Yanadi

- Nellore plains: rivers, tanks, lakes and canals
- Inland fishing and agricultural labour
- Strong concentration in Nellore; distinct from the hill PVTG list





Yerukula

- Communities across Andhra Pradesh
- Basket-making, pig rearing and small businesses

Sugali / Lambada

- Hamlets called tandas
- Historically mobile; now many settled cultivators and cattle rearers
- The undivided-State 'largest tribe' ranking cannot be carried over to present AP





Nakkala

- Nellore and neighbouring areas
- Small-toy making and itinerant sales



One hill-belt distinction: Koya

- Godavari gorges • totemic clans
- Koya and Konda Reddi are distinct communities

Koya, Yanadi, Yerukula and Sugali are not among AP's listed PVTGs

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Place names and living culture

Location guide • October 2026

Today's location clues

- Seethampeta and Parvathipuram → Parvathipuram Manyam
- Paderu → Alluri Sitharama Raju
- Rampachodavaram → Polavaram
- Srisailam → Nandyal

Old districts for those places:
Srikakulam; Vizianagaram; Visakhapatnam; East Godavari; Kurnool

ITDA = Integrated Tribal Development Agency
Agency = a hilly, forested tribal tract



Dhimsa

- Araku Valley hill-tribe group dance
- Accompaniment includes mori (wind), thudum (drum), dappu

Festivals

- Itika Pongal: hunting and harvest traditions
- Patha Vithanala Pandaga: indigenous seed festival, April

Araku coffee



GCC = Girijan Cooperative Corporation

Araku Tribal Museum

Hamlet models, utensils, tools and musical instruments



Broad associations, not exclusive boundaries or fixed ways of life

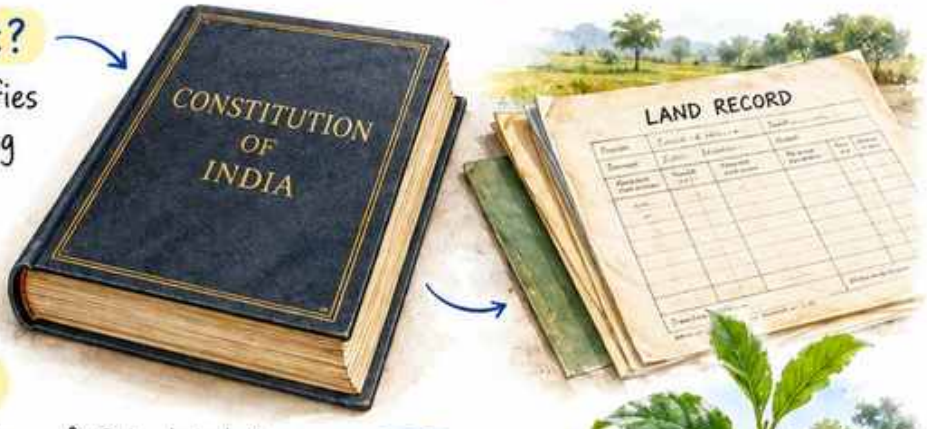
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Protection and development

Who changes the ST list?

- Article 342: President specifies the State list after consulting the Governor
- Parliament alone can add or remove entries by law



Land and forest rights

- Fifth Schedule: administration of Scheduled Areas
- Regulation 1 of 70 restricts land transfers to non-tribals in Scheduled Areas
- Samatha judgment, 1997: private-company mining leases fall within the restriction
- Forest Rights Act, 2006: individual and community forest rights
- Commencement: 31 December 2007 • Rules: 1 January 2008



PM-JANMAN

- Launched 15 November 2023, Khunti, Jharkhand
- For 75 PVTG communities • 18 States and one UT
- Rs 24,104 crore • 11 interventions • 9 Ministries



Dharti Aaba Janjatiya Gram Utkarsh Abhiyan

- Launched 2 October 2024, Hazaribagh, Jharkhand
- 17 Ministries • tribal-village development

Other support

- Tribal Sub-Plan: Fifth Five Year Plan; AP law, 2013
- Eklavya Model Residential Schools: residential education



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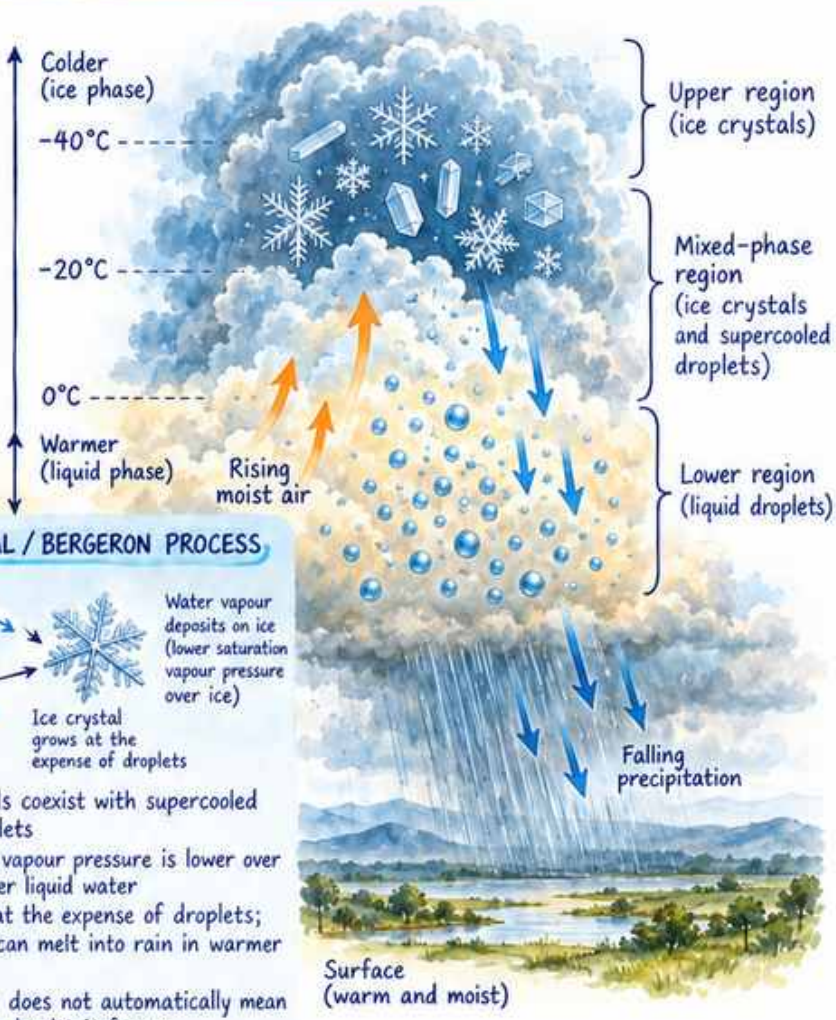
HOW RAIN FORMS

Lift, cooling, condensation and growth

FROM MOIST AIR TO RAIN

Moist air rises → expands and cools → reaches saturation → water vapour condenses on nuclei → droplets or ice crystals grow → precipitation falls

- Dust, smoke and sea salt can act as condensation nuclei
- Rain is liquid precipitation; snow, sleet and hail are other forms



TWO WAYS PARTICLES GROW

COLLISION-COALESCENCE



- Larger drops fall faster, collide with smaller drops and merge
- Important in tropical warm clouds; rain can form even when the cloud top is too warm for ice
- Deeper tropical clouds may also contain ice

ICE-CRYSTAL / BERGERON PROCESS

- Ice crystals coexist with supercooled liquid droplets
- Saturation vapour pressure is lower over ice than over liquid water
- Ice grows at the expense of droplets; falling ice can melt into rain in warmer air below
- Below 0°C does not automatically mean every cloud droplet is frozen

THREE MAIN LIFTING MECHANISMS

Convectional



surface heating lifts air

Orographic



mountains force moist air upward

Cyclonic



ascent in cyclones, including fronts in temperate cyclones

Monsoon describes a seasonal wind regime, not a fourth lifting mechanism

MEASUREMENT



- Rain gauge: measures rainfall amount
- Isohyet: line joining places of equal precipitation
- Drizzle drops: about 0.2–0.5 mm; raindrops rarely exceed about 6 mm

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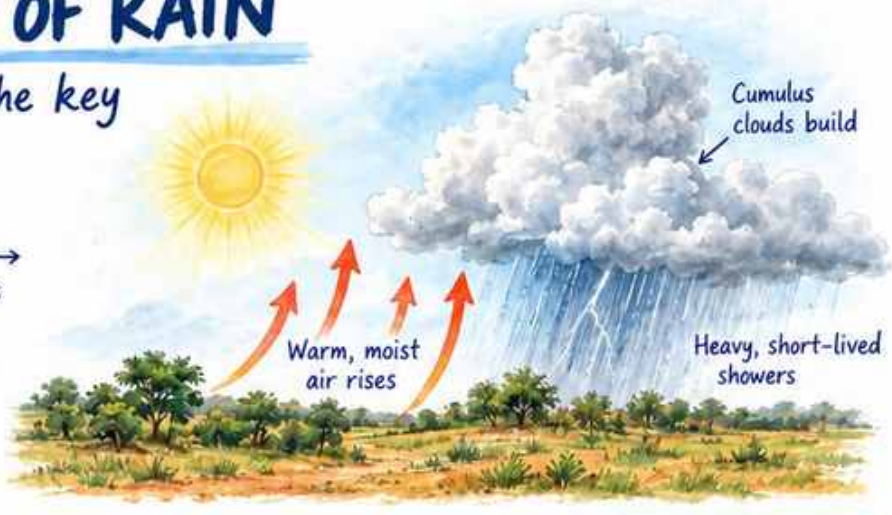
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THREE TYPES OF RAIN

The lifting process is the key

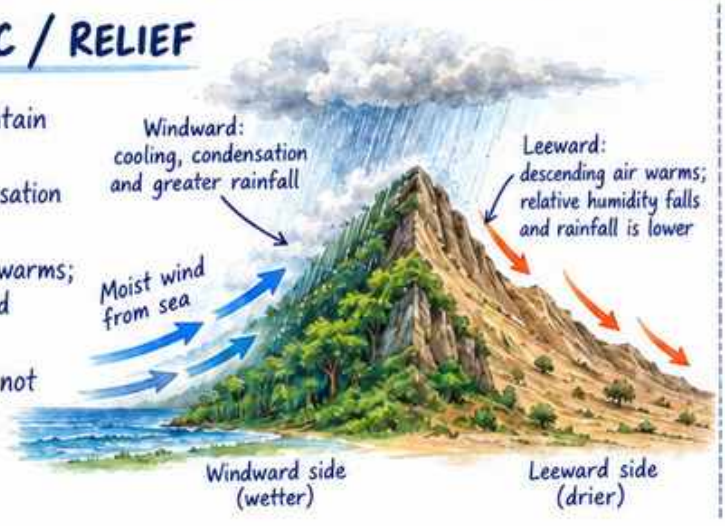
1 CONVECTIONAL

- Sun-heated surface warms moist air → air rises, expands and cools → cumulus clouds build
- Usually heavy, short-lived showers; thunder and lightning may occur
- Typical: equatorial afternoons and summer continental interiors



2 OROGRAPHIC / RELIEF

- Moist wind meets a mountain and rises
- Windward: cooling, condensation and greater rainfall
- Leeward: descending air warms; relative humidity falls and rainfall is lower
- Rain shadow means drier, not necessarily rainless



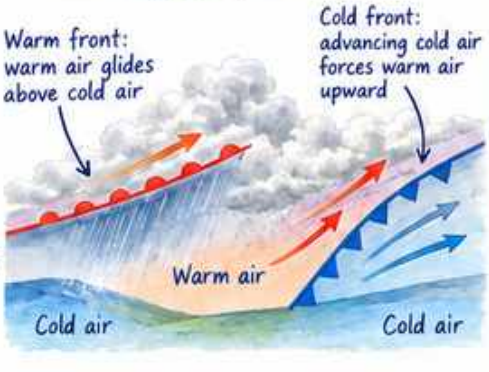
INDIAN EXAMPLES

- Western Ghats: Arabian Sea monsoon winds rise on the western, windward slopes; heavy rain, often over 250 cm annually
- Interior Deccan east of the Ghats: rain shadow, but still receives rain
- Khasi Hills, Meghalaya: strong uplift of moist winds; Mawsynram and Cherrapunji are exceptionally wet
- Rainfall amounts vary by location and year

3 CYCLONIC

- Temperate cyclones: warm air rises over colder air at fronts
- Warm front: warm air glides above cold air
- Cold front: advancing cold air forces warm air upward
- Tropical cyclones: strong moist-air ascent in the eyewall and rainbands; very heavy rain can occur
- Do not apply a frontal explanation to all tropical-cyclone rain

TEMPERATE CYCLONES (Frontal)



TROPICAL CYCLONES (No fronts)



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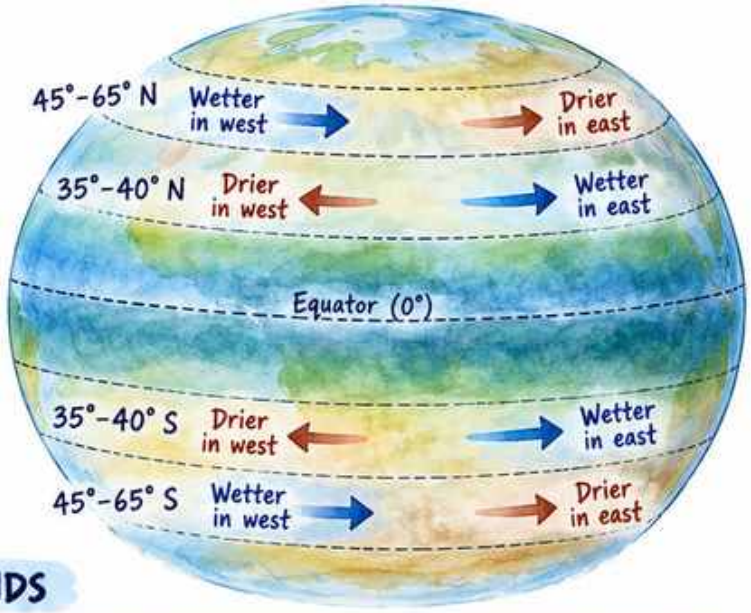
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WHERE & WHEN RAIN FALLS

Broad patterns, with regional exceptions

WORLD PATTERNS

- Rainfall broadly decreases from equatorial regions towards the poles, but circulation and relief create major exceptions
- Coasts generally receive more rain than continental interiors; oceans generally receive more than land
- 35°–40° N and S: eastern coasts wetter; rainfall decreases westward
- 45°–65° N and S: westerlies reach western margins first; rainfall generally decreases eastward
- A coastal mountain barrier makes its moist-wind-facing side wetter and its lee side drier



BROAD ANNUAL RAINFALL BANDS

Over 200 cm:	equatorial belt; windward western-coast mountains in the cool temperate zone; monsoon coasts
100–200 cm:	interior continental areas
50–100 cm:	central tropical lands; eastern and interior temperate lands
Under 50 cm:	continental rain-shadow zones and high latitudes

Rainfall bands show broad patterns; local conditions can differ.

SEASONS MATTER AS MUCH AS TOTALS

Equatorial



rain in every month, often afternoon thunderstorms

Mediterranean



hot dry summers; mild rainy winters; about 35–90 cm annually

Tropical monsoon



heavy rain mainly in summer, usually a drier winter; local exceptions occur

Marine west coast



precipitation throughout the year; about 50–250 cm; many areas have a winter maximum

MONSOON + RELIEF + CYCLONES



- Seasonal wind reversal supplies moist air; mountains and monsoon depressions help produce rain
- No single annual total tells us how evenly rainfall is spread through the year

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DRY REGIONS & RAIN RECORDS

Always name the mechanism and the measure



WHY DRY REGIONS FORM

- **Subtropical highs:** descending air warms and suppresses clouds
- **Cold currents:** stabilise coastal air; fog can occur with little rain
- **Rain shadows:** leeward air descends and warms
- **Polar regions:** cold air has little moisture; precipitation is low

DESERT CONNECTIONS

- **Sahara + Australian deserts:** subtropical highs
- **Atacama:** Humboldt Current + South Pacific high + Andes blocking Atlantic moisture
- **Namib:** cold Benguela Current
- **Patagonia:** east of Andes, sheltered from Pacific westerlies
- **Great Basin:** rain shadow of Sierra Nevada and Cascades
- **Thar:** monsoon desert; weak moisture penetration
- **Kalahari:** semi-desert; winter high pressure

WMO RECORDS: DIFFERENT MEASURES

Mawsynram, India:	Asia's highest average annual precipitation — **11,872 mm** over 38 years
Cherrapunji, India:	world 12-month rainfall — **26,470 mm**, August 1860–July 1861
Cherrapunji:	world 48-hour rainfall — **2,493 mm**, 15–16 June 1995
Foc-Foc, La Réunion:	world 24-hour rainfall — **1,825 mm**, 7–8 January 1966; Cyclone Denise
Arica, Chile:	South America's lowest annual average — **0.76 mm** over 59 years
Arica:	world's longest dry period — **172 months**, October 1903–January 1918
Wadi Halfa, Sudan:	Africa's lowest annual average — **less than 2.54 mm** over 39 years



RECALL

- Compare rainfall records using the same measure, period and geographic scope.
- Average rainfall ≠ a single 12-month total ≠ a 24-hour extreme
- Record-list date: July 2025

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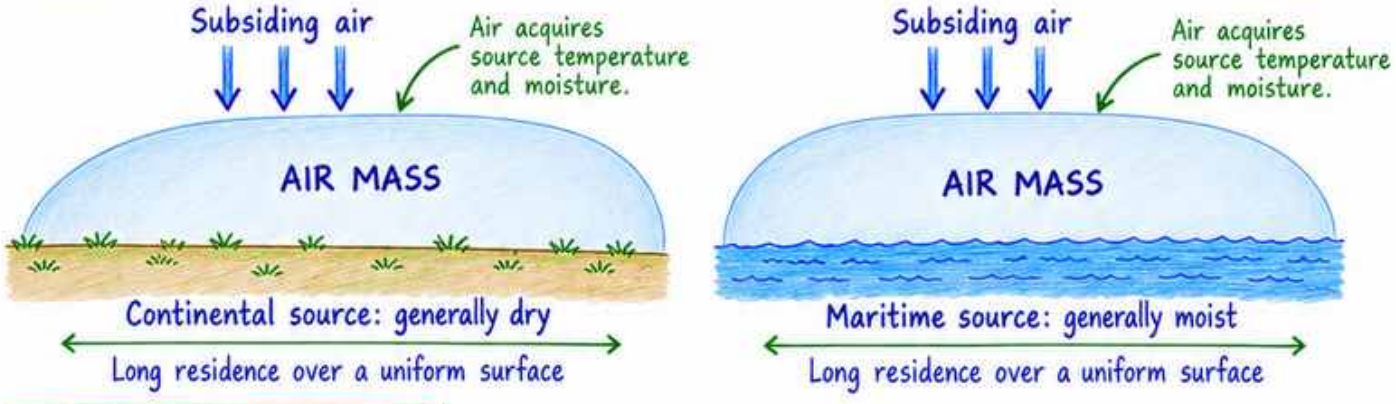
AIR MASSES: SOURCE REGIONS

AN AIR MASS

A large body of air with little horizontal variation in temperature and moisture at a given altitude.

SOURCE REGION → AIR MASS

- A vast, uniform ocean or plain + sufficient time in contact → air acquires the surface's temperature and moisture.
- Subsiding air and slow movement favour formation.
- Subtropical high-pressure belts supply tropical air; polar regions supply polar air.



DECODE THE NAME

An air mass name has two letters, e.g., cT, mP.

First letter: moisture (small letter)

c = continental → land → dry
m = maritime → ocean → moist

Second letter: temperature (capital letter)

T = tropical → warm / hot
P = polar → cold
A = arctic / antarctic → very cold

Additional information

- Small first letter; moisture.
- Capital second letter: temperature.
- Some classifications also use E for equatorial air.

REMEMBER

The name describes the source region, not the destination.

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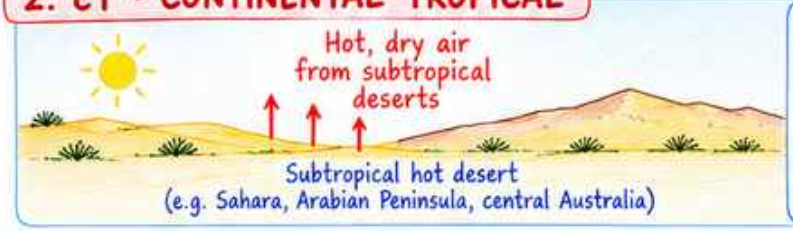
FIVE COMMON AIR-MASS TYPES

1. mT · MARITIME TROPICAL



- Warm tropical / subtropical oceans → warm + moist.
- Example: Atlantic near Azores-Bermuda.
- Over a cooler sea: stable air, low cloud, drizzle, hill fog.

2. cT · CONTINENTAL TROPICAL



- Subtropical hot deserts → hot + dry.
- Examples: Sahara, Arabian Peninsula, central Australia.
- Hot dry days; visibility may be poor.

3. mP · MARITIME POLAR



- Cold high-latitude oceans → cold + moist.
- Example: air crossing the North Atlantic from Greenland / northern Canada.
- Warmer seas destabilise it → showers.

4. cP · CONTINENTAL POLAR



- Snow-covered high-latitude continents → cold + dry.
- Examples: Canada, Scandinavia.
- Clear winter skies and severe frost.

5. cA · CONTINENTAL ARCTIC



- Ice- and snow-covered LAND in the Arctic region and Antarctica → very cold + dry.
- Examples: northern Siberia in winter.
- Colder than cP.

CLASSIFICATION CHECK

- The five examples shown are not an exhaustive classification.
- Bergeron classification also recognises maritime arctic air.
- The Arctic is a region, not a continent.

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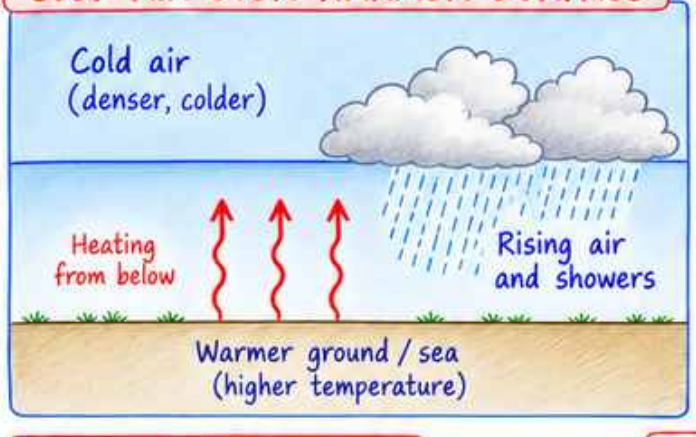
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AIR MASS MODIFICATION & FRONTS

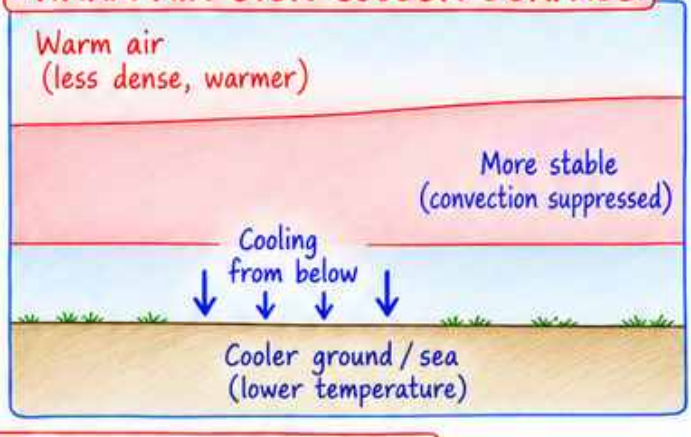
AIR MASSES CHANGE ALONG THE JOURNEY

- Sea track → evaporation adds moisture, especially near the ground.
- Long land track → air stays dry.
- Cold air over warmer ground / sea → heating from below → less stable → rising air and showers.
- Warm air over cooler ground / sea → cooling from below → more stable.

COLD AIR OVER WARMER SURFACE



WARM AIR OVER COOLER SURFACE



BERGERON SUFFIXES

k = air colder than the surface below, e.g. mPk.

w = air warmer than the surface below, e.g. mTw.

FRONT = BOUNDARY ZONE

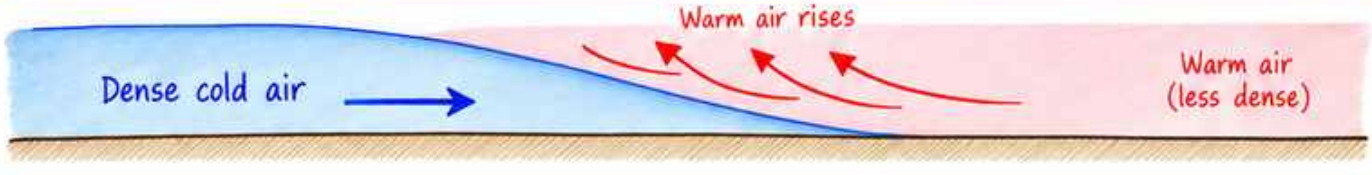
- Different air masses meet across a temperature and density contrast.
- Frontogenesis = formation of a front.
- Middle-latitude fronts: steep temperature / pressure gradients, abrupt weather changes, uplift, clouds and precipitation.

NAME FOLLOWS THE ADVANCING AIR

- Cold air advances → cold front.
- Warm air advances → warm front.
- Neither replaces the other → stationary front.

AT BOTH MOVING FRONTS, WARM AIR RISES

- Cold air undercuts; warm air rides up.
- A modified cP air mass does not become tropical merely by crossing warm water.



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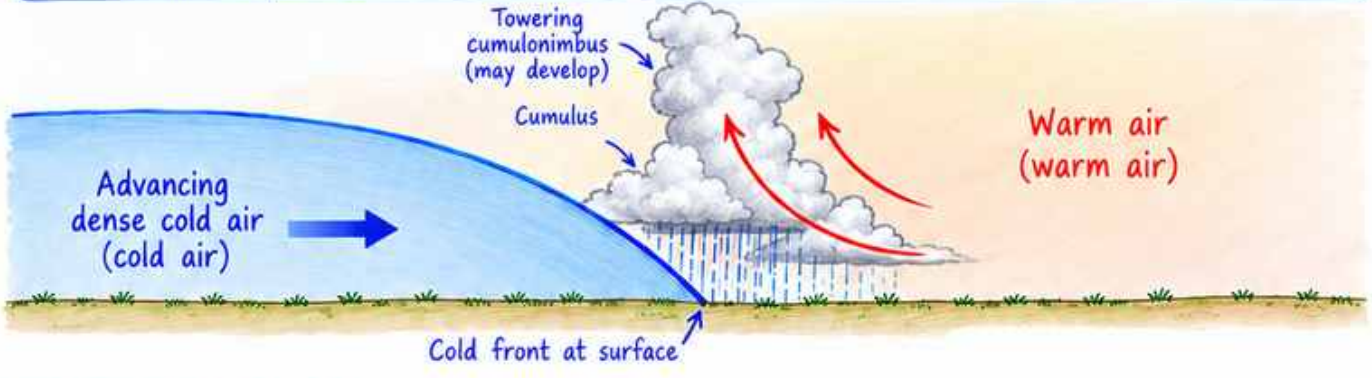
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COLD FRONT vs WARM FRONT

COLD FRONT

- Advancing dense cold air undercuts warm air → rapid uplift.
- Steep slope: about 1:50 to 1:100. Often up to twice as fast as a warm front.
- Cloud: cumulus; towering cumulonimbus may develop.
- Rain: heavy showers in a narrow band; thunder, squalls, sometimes hail; ends abruptly.
- After passage: temperature falls, pressure rises, wind shifts; skies clear, some showers possible.

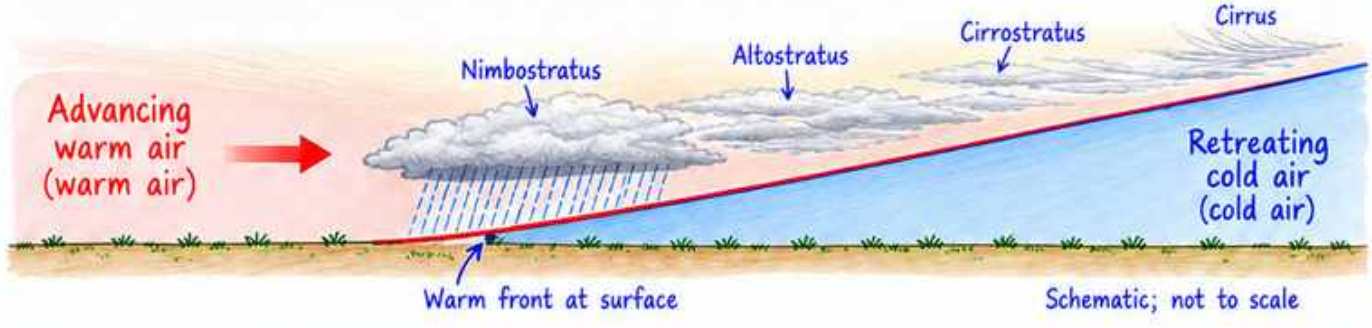
Symbol: Blue triangles point in the direction of movement.



WARM FRONT

- Advancing warm air glides over retreating cold air → gradual uplift.
- Gentle slope; slower movement.
- Cloud sequence: cirrus → cirrostratus → altostratus → nimbostratus. Cloud base lowers.
- Rain: drizzle, then continuous rain over a wide belt.
- After passage: temperature rises, pressure steadies; rain stops and cloud thins.

Symbol: Red semicircles point in the direction of movement.



ONE RULE FOR BOTH

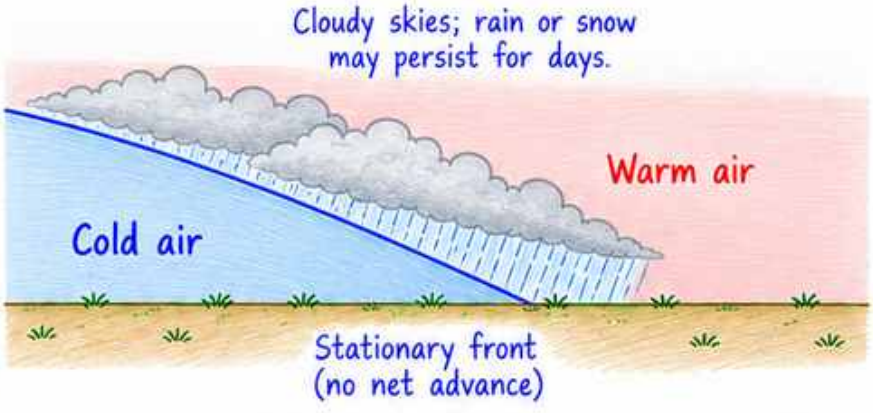
- Warm air rises; the advancing air gives the front its name.

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STATIONARY & OCCLUDED FRONTS

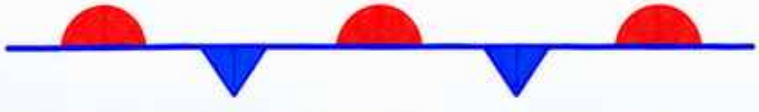
STATIONARY FRONT

- Neither air mass replaces the other; the front stops moving.
- Cloudy skies; rain or snow may persist along it for days.
- It may weaken or become a cold or warm front.



MAP SYMBOL

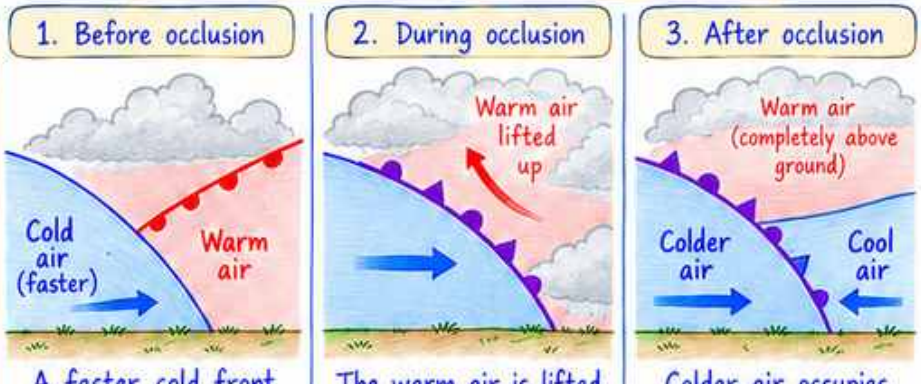
Alternating red semicircles and blue triangles on OPPOSITE sides of the line.



OCCLUDED FRONT

- A faster cold front catches a warm front.
- The warm air is lifted off the ground; colder air occupies the surface.
- Weather combines cold- and warm-front features. Cumulonimbus or nimbostratus may bring precipitation.
- After passage: usually clearer and drier. A mature low begins to weaken as its warm-air supply is cut off.

Formation of an occluded front (3 stages)



MAP SYMBOL

Purple triangles and semicircles on the SAME side of the line, facing the movement.



OCCLUSION CUE

Warm air fully lifted above the land surface → occlusion.

LIFE-CYCLE LINK

Stationary boundary can begin the sequence; occlusion develops late.

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POLAR FRONT & CYCLONE LIFE CYCLE

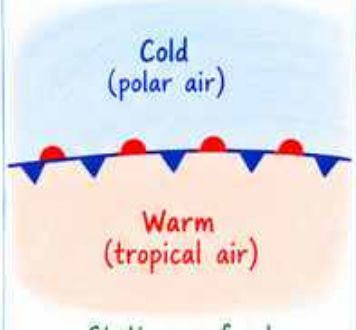
POLAR FRONT

- Boundary of polar and tropical air in middle / high latitudes, generally poleward of about 30° in both hemispheres.
- Temperature contrast supplies energy; the polar-front jet is associated with it.

LIFE CYCLE OF A FRONTAL (POLAR-FRONT) CYCLONE

1 · STATIONARY BOUNDARY

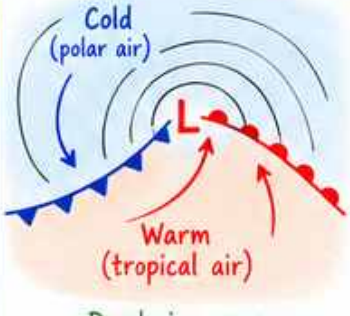
Warm equatorward air meets cold poleward air.



Stationary front (plan view)

2 · WAVE DEVELOPS

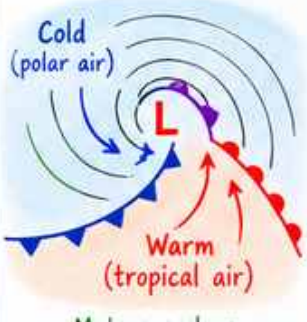
An upper-air disturbance creates a kink: a warm front and cold front develop.



Developing wave (plan view)

3 · MATURE LOW

Faster cold front catches the warm front → occlusion.



Mature cyclone (plan view)

4 · WEAKENING

Warm, moist air is lifted off the surface; the low loses its supply and dissipates.



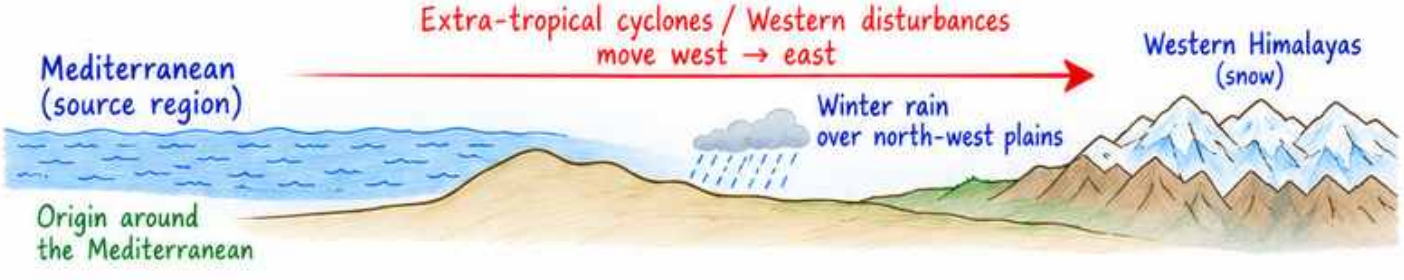
Occluded / weakening stage (plan view)

POLAR-FRONT THEORY

- Bergen / Scandinavian school: Vilhelm Bjerknes led the work.
- Jacob Bjerknes linked fronts to depressions (1919).
- Bjerknes–Solberg life cycle (1922).
- Tor Bergeron explained occlusion.

INDIA CONNECTION

- Extra-tropical cyclones generally move west → east.
- Western disturbances originate around the Mediterranean: winter rain over north-west plains, snow in the western Himalayas.
- Frontal distinction: extra-tropical cyclones have a clear frontal system; tropical cyclones do not.



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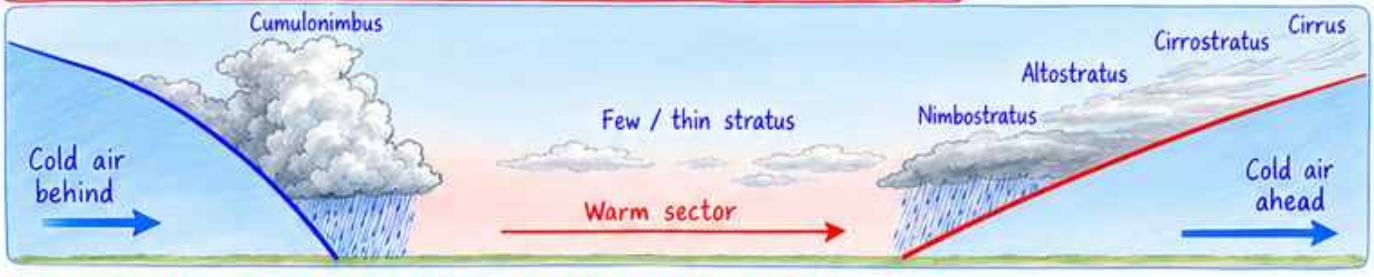
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A FRONTAL DEPRESSION PASSES

A FRONTAL DEPRESSION

A frontal depression is a mid-latitude low with warm and cold fronts and a warm sector between them.

CROSS-SECTION THROUGH A FRONTAL DEPRESSION



A GROUND OBSERVER'S WEATHER SEQUENCE

1 AHEAD OF WARM FRONT



- High cirrus, then cirrostratus.
- Pressure falls steadily.
- Temperature rises.
- No rain yet.

↓ Pressure falls ↑ Temperature rises

2 WARM FRONT PASSES



- Altostratus → nimbostratus; cloud base lowers.
- Pressure falls.
- Temperature rises.
- Drizzle → continuous rain.

↓ Pressure falls ↑ Temperature rises

3 WARM SECTOR



- Stratus / stratocumulus may remain; cloud thins.
- Pressure steadies.
- Air is warm.
- Rain stops; mostly fine.

↔ Pressure steadies ↑ Warm air

4 COLD FRONT PASSES



- Towering cumulonimbus.
- Pressure rises.
- Temperature falls.
- Heavy downpours, squalls, possible thunder and hail.

↑ Pressure rises ↓ Temperature falls

5 BEHIND COLD FRONT



- A few small cumulus.
- Pressure keeps rising.
- Cool air.
- Generally fine, with a few showers.

↑ Pressure rises ↓ Cool air

LINK THE CLUES

1. Widespread steady rain → Warm front.
2. Brief heavy showers → cold front.
3. Warm air aloft → occlusion.

Diagrams schematic.

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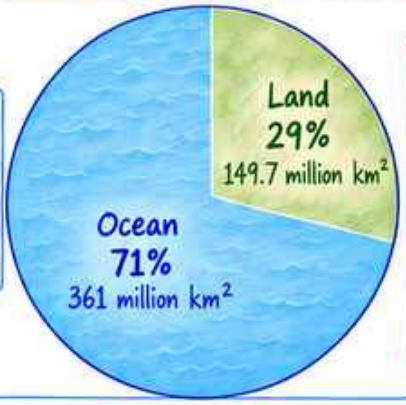
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OUR WORLD: LAND & WATER

SURFACE BALANCE

- Ocean ≈ 71% · 361 million km²
- Land ≈ 29% · 149.7 million km²
- Seven continents; five oceans.



PACIFIC ALONE > ALL LAND

Pacific Ocean area
168.7 million km²
>
Total land area
149.7 million km²

CONTINENTS BY AREA



- Areas in million km².
- The Australia figure includes nearby islands.

HEMISPHERES

- Most land lies in the Northern Hemisphere.
- Australia and Antarctica lie entirely in the Southern Hemisphere.

Most land is north of the Equator.

Australia and Antarctica lie entirely south of it.

MAXIMUM-LAND HEMISPHERE

1945 determination: centre at Nantes, France.

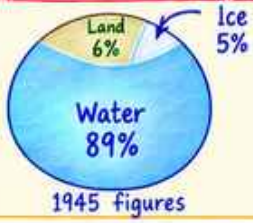
- Contains 80.1% of the world's land, yet its own surface is 53% water and 47% land.



1945 figures

- This hemisphere contains 80.1% of the world's land.
- Its own surface is 53% water and 47% land.

Opposite water hemisphere: centre near New Zealand's



1945 figures

- About 89% water, 6% dry land, 5% polar ice cap.
- Centre near New Zealand's Bounty Islands.

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ASIA & AFRICA: PHYSICAL FEATURES

ASIA : LARGEST CONTINENT

- Area: 44.61 million km²; about 29.8% of world land.

HIGHEST: EVEREST

Everest, Himalayas 8,849 m.

Joint Nepal–China measurement (2020): 8,848.86 m.



LOWEST EXPOSED LAND

Dead Sea shore, about −430 m.



LONGEST RIVER

Yangtze / Chang Jiang, 6,300 km.



LARGEST DESERT

Arabian Desert, 2.33 million km²; larger than the Gobi (1.295 million km²).



PLATEAU: TIBET

About 2.5 million km² and 5,000 m; world's largest and highest plateau.



AFRICA : SECOND LARGEST

- Area: 30.37 million km².

HIGHEST: KILIMANJARO

Kilimanjaro, 5,895 m.



LOWEST

Lake Assal, Djibouti, about −153 m.



LONGEST RIVER

Nile, traditionally 6,650 km.



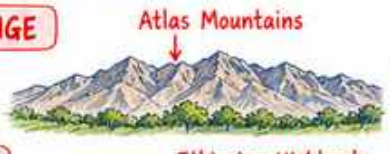
LARGEST HOT DESERT

Sahara, 9.2 million km².



NORTH-WEST RANGE

Atlas Mountains.



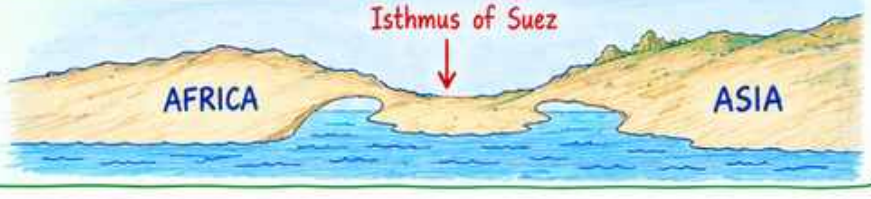
HIGHEST PLATEAU

Ethiopian Highlands, the "Roof of Africa".



CONNECTION

Africa and Asia are joined by the Isthmus of Suez.



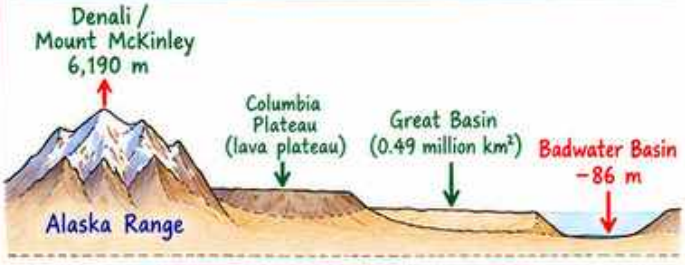
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THE AMERICAS: PEAKS TO RIVERS

NORTH AMERICA · THIRD LARGEST

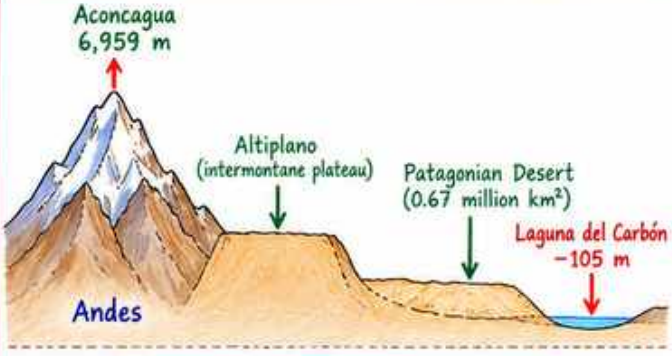
- Area: 24.23 million km².
- Highest: Denali / Mount McKinley, Alaska Range, 6,190 m. The same peak; US federal usage restored Mount McKinley in 2025.
- Lowest: Badwater Basin, Death Valley, about −86 m.
- Longest river system: Mississippi–Missouri, 6,275 km.
- Largest wholly continental desert: Great Basin, 0.49 million km². Polar Arctic Desert also reaches the far north.
- Lava plateau: Columbia Plateau, USA.





SOUTH AMERICA · FOURTH LARGEST

- Area: 17.81 million km².
- Highest: Aconcagua, Andes, 6,959 m.
- Lowest: Laguna del Carbón, Argentina, about −105 m.
- Longest river: Amazon, about 6,400 km.
- Largest desert: Patagonian, 0.67 million km².
- Altiplano: intermontane plateau, mainly Bolivia / Peru; largest extensive high plateau outside Tibet.





CONNECTIONS

Isthmus of Panama

- Isthmus of Panama joins the two Americas.



Bering Strait

- Bering Strait separates Asia and North America.
- About 85 km wide.
- Links Arctic Ocean to Bering Sea.
- Ice ages exposed the Bering Land Bridge.



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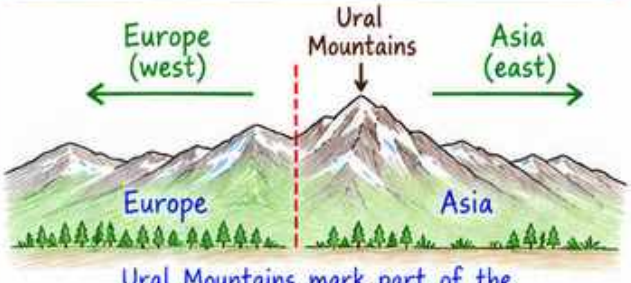
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EUROPE & AUSTRALIA: BOUNDARY CUES

EUROPE · SIXTH LARGEST

- Area: about 10.00 million km².
- Highest: Elbrus, Caucasus, 5,642 m, when the boundary includes it in Europe. Lists excluding it use Mont Blanc, Alps, 4,810 m.
- Lowest: Caspian Sea shore, about −28 m.
- Longest river: Volga, 3,645 km.
- Only the polar Arctic Desert reaches northern Europe.

- Europe + Asia = Eurasia. The Ural Mountains mark part of the conventional division.



Ural Mountains mark part of the conventional division between Europe and Asia.



AUSTRALIA · SMALLEST CONTINENT

- Area: 8.51 million km² in the Australia / Oceania list; includes nearby islands.
- Mainland high point: Kosciuszko, Great Dividing Range, 2,228 m.
- Including New Guinea: Puncak Jaya, Sudirman Range, 4,884 m.
- Lowest: Lake Eyre, about −16 m.
- Longest river system: Murray-Darling, 3,672 km.
- Great Australian Desert: 1.37 million km² combined; largest named part is Great Victoria, about 0.35 million km².
- Western Plateau: ancient stable craton, average elevation about 305–460 m.





READ THE DEFINITION

Europe's peak depends on its boundary; Australia's peak depends on mainland versus wider continent.

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ANTARCTICA: SURFACE vs BEDROCK

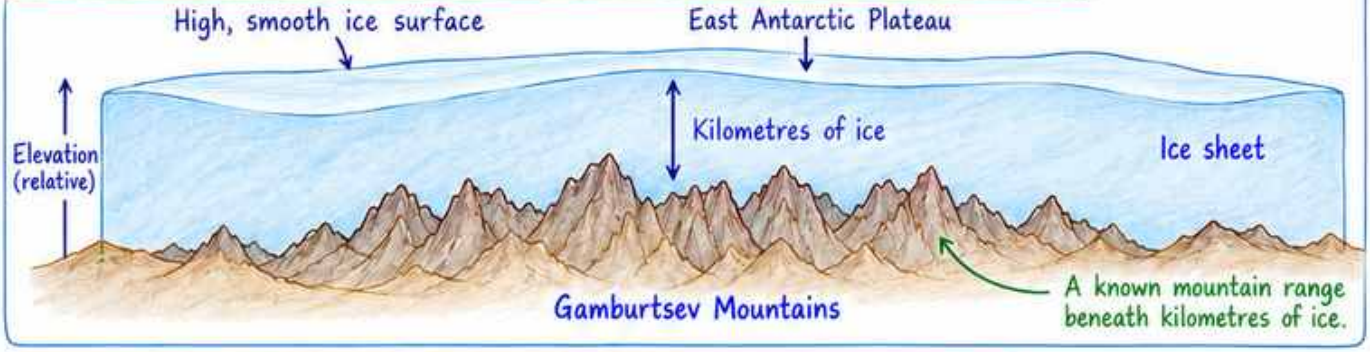
ANTARCTICA · FIFTH LARGEST

- Area: about 14.20 million km²; larger than Europe and Australia.
- Highest peak: Mount Vinson, Sentinel Range, 4,892 m.
- Largest desert: Antarctic polar desert, about 14.2 million km². Deserts need not be hot.

EAST ANTARCTIC PLATEAU

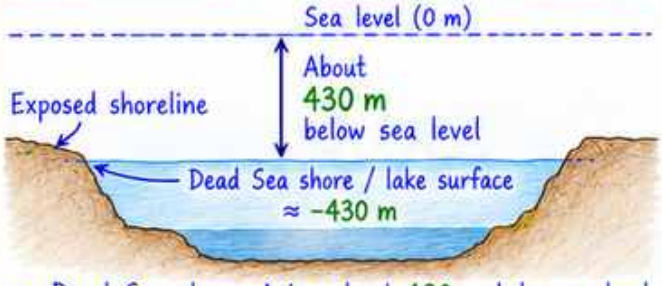
- A vast, high, ice-covered plateau.
- A smooth ice surface does NOT mean smooth bedrock.
- Gamburtsev Mountains are a known mountain range beneath kilometres of ice.

ICE SHEET CUTAWAY: GAMBURTSEV MOUNTAINS (EAST ANTARCTICA)



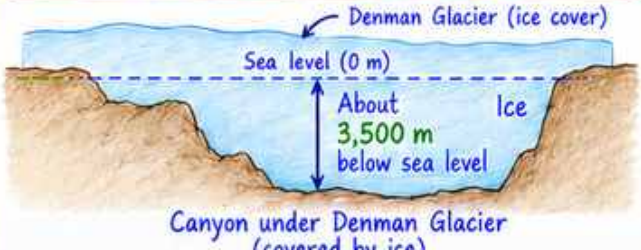
TWO DIFFERENT "LOWEST" RECORDS (AT SEA-LEVEL DATUM)

Dead Sea shore, Asia: about 430 m below sea level



- Dead Sea shore, Asia: about 430 m below sea level → exposed land.

Canyon under Denman Glacier, Antarctica: bedrock about 3,500 m below sea level



- Canyon under Denman Glacier, Antarctica: bedrock about 3,500 m below sea level → covered by ice.

Do not confuse exposed land with subglacial bedrock.

DESERT RECORDS AND OTHER FACTS

- Largest desert overall → Antarctica, polar.
- Largest subtropical / hot desert → Sahara, Africa, 9.2 million km².
- Australia and Antarctica are the two continents entirely south of the Equator.

REMEMBER
Cross-sections are schematic; elevations are approximate.

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FIVE OCEANS: AREA & DEEPEST POINTS

RANK BY AREA · MILLION km²

Percentages are shares of ocean area.

Rank	Ocean	Area (million km²)	Share of ocean area
1	Pacific	168.72	46.6%
2	Atlantic	85.13	23.5%
3	Indian	70.56	19.5%
4	Southern	21.96	6.1%
5	Arctic	15.56	4.3%

DEEPEST-POINT MATCHES

- Pacific → Challenger Deep, Mariana Trench, about 10,935 m.
- Atlantic → Brownson Deep, Puerto Rico Trench, 8,376 m.
- Indian → Sunda / Java Trench.
- Southern → southern end of South Sandwich Trench, 7,434 m in the expedition list.
- Arctic → Molloy Deep, 5,550 m.

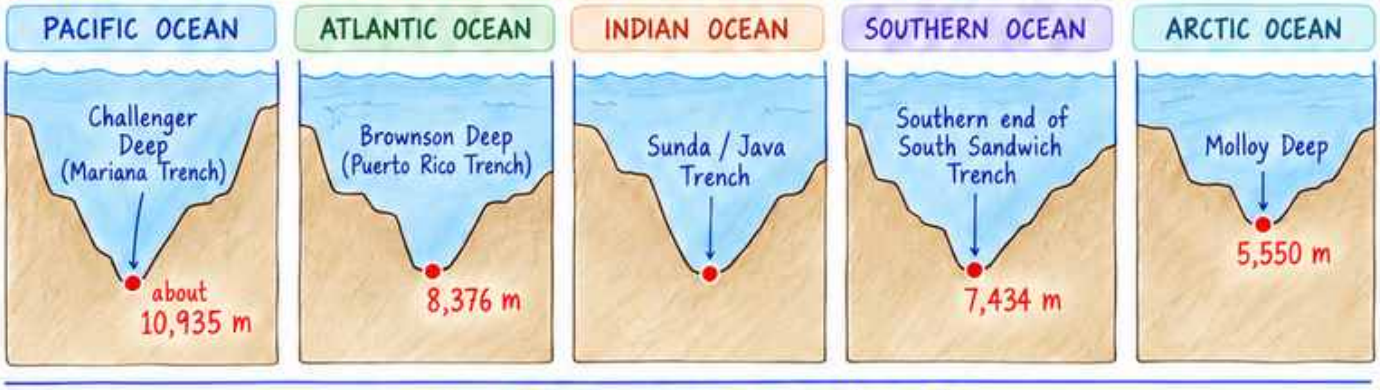
DEPTHS VARY BY SURVEY

- Challenger Deep: about 10,935 m; other surveys list 10,928 m or 11,034 m.
- Atlantic: Milwaukee Depth, 8,380 m, is an alternative named depth in the Puerto Rico Trench.
- Southern: "Factorian Deep" is an expedition name; other lists give 7,236 m.

LARGEST & SMALLEST

- Pacific is largest and larger than all continents combined; Arctic is smallest.

SEA-FLOOR CROSSSECTIONS (SCHEMATIC, NOT TO COMMON DEPTH SCALE)



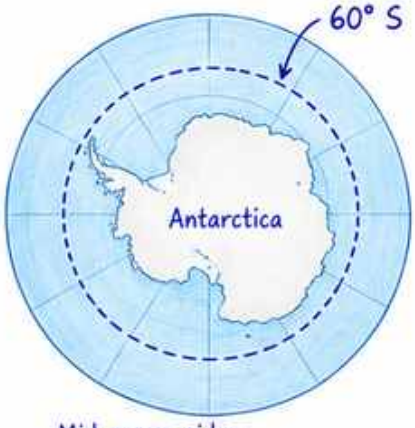
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SOUTHERN OCEAN & PLATEAU TYPES

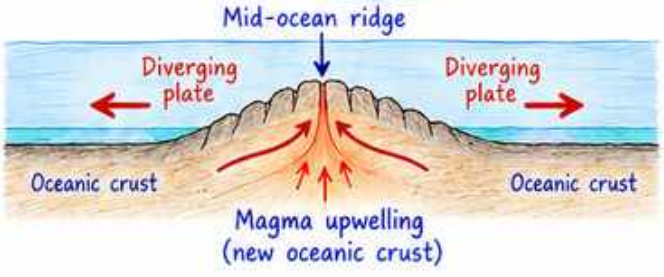
SOUTHERN OCEAN: KNOW THE CONVENTION

- Fifth named ocean: waters around Antarctica, commonly coast to 60° S.
- US Board on Geographic Names: recognised since 1999.
- National Geographic: recognised in June 2021.
- IHO: omitted it from the 1953 limits; proposed 2000 boundary has not been ratified.



MID-OCEAN RIDGES

- Submarine mountain chains occur in every ocean basin.
- Mid-Atlantic Ridge runs broadly north-south for about 16,000 km.



FOUR PLATEAU TYPES

1. INTERMONTANE PLATEAU

- Enclosed by fold mountains.
- Examples: Tibetan Plateau; Altiplano.



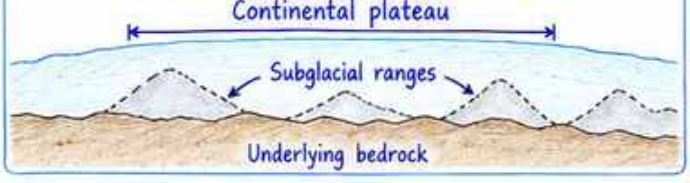
2. LAVA / VOLCANIC PLATEAU

- Repeated lava flows through fissures.
- Examples: Deccan Traps; Columbia Plateau.



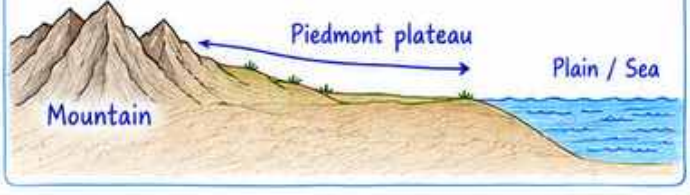
3. CONTINENTAL PLATEAU

- Broad plateau away from bordering mountains.
- Example: Antarctic Plateau in this four-type scheme.
- Underlying bedrock includes subglacial ranges.



4. PIEDMONT PLATEAU

- Mountains on one side, plain / sea on the other.
- Example: eastern United States.



COMPARE THE PROFILES

- Intermontane = between mountains.
- Lava = stacked flows.
- Piedmont = mountain foot.

REMEMBER

- All profiles schematic, not to scale.

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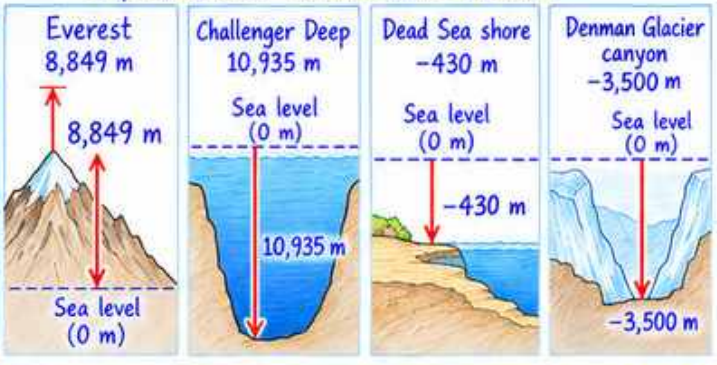
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WORLD RECORDS: MATCH THE MEASURE

HEIGHT & DEPTH

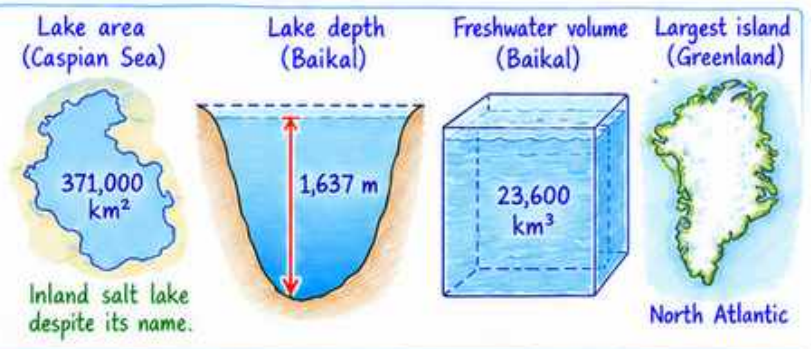
- Highest point: Everest, Himalayas, 8,849 m.
- Deepest ocean point: Challenger Deep, Pacific, about 10,935 m.
- Lowest exposed land: Dead Sea shore, Asia, about −430 m.
- Lowest subglacial land: Denman Glacier canyon, Antarctica, about −3,500 m.

Separate sites; schematic, not to scale



LAKES & ISLAND

- Largest lake by area: Caspian Sea, about 371,000 km²; an inland salt lake despite its name.
- Deepest lake: Baikal, Siberia, 1,637 m.
- Largest freshwater volume: Baikal, about 23,600 km³.
- Largest island: Greenland, North Atlantic.



RIVERS: LENGTH IS NOT FLOW

- Traditional longest: Nile, about 6,650 km.
  ↳ Amazon length claims remain disputed.
- Largest average discharge among the world's longest rivers: Amazon, about 230,000 m³/s.



PLATEAU & DESERT

- Largest / highest plateau: Tibet, about 2.5 million km², about 5,000 m.
- Largest desert: Antarctica, polar.
- Largest hot desert: Sahara.



READ THE METRIC

- Lake area ≠ lake depth ≠ freshwater volume.
- River length ≠ discharge.
- Exposed land ≠ land under ice.

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CYCLONES: LOW PRESSURE & ROTATION

A cyclone is a wind system around a centre of LOW pressure. Air converges at the surface and rises.

Two kinds:

- TROPICAL cyclones draw energy from condensation over warm seas.
- TEMPERATE / EXTRA-TROPICAL cyclones form along fronts in middle and high latitudes.

CORIOLIS DEFLECTION

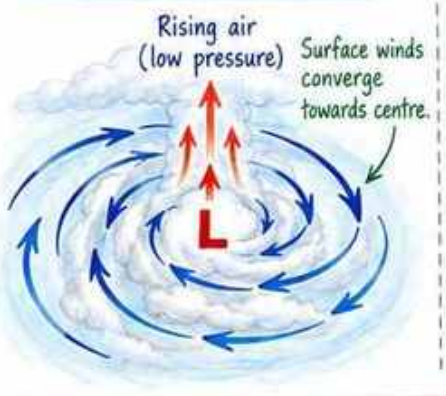
- Northern hemisphere: moving air deflects RIGHT.
- Southern hemisphere: moving air deflects LEFT.

CYCLONE ROTATION

Northern hemisphere: ANTICLOCKWISE.

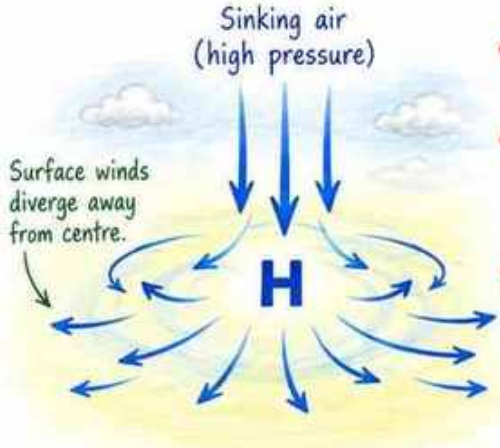


Southern hemisphere: CLOCKWISE.



The deflection makes air circulate around the low instead of flowing straight into it.

ANTICYCLONE = HIGH PRESSURE



- Air sinks and diverges at the surface.
- Rotation is the reverse: clockwise in the north, anticlockwise in the south.
- Usually weaker than a cyclone; commonly dry weather.

TORNADO



- A violent, narrow spiralling wind descends from a severe thunderstorm, with very low pressure at its centre.
- Usually middle latitudes.
- Over the sea: a waterspout.



REMEMBER: low = convergence + rising air; high = divergence + sinking air.

Related: Coriolis, Day 5 Topic 44; thunderstorms and tornadoes, Topic 894.

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TROPICAL CYCLONES: THE FORMATION RECIPE

Violent storms originate over tropical oceans and move towards coasts.

FIVE FAVOURABLE CONDITIONS

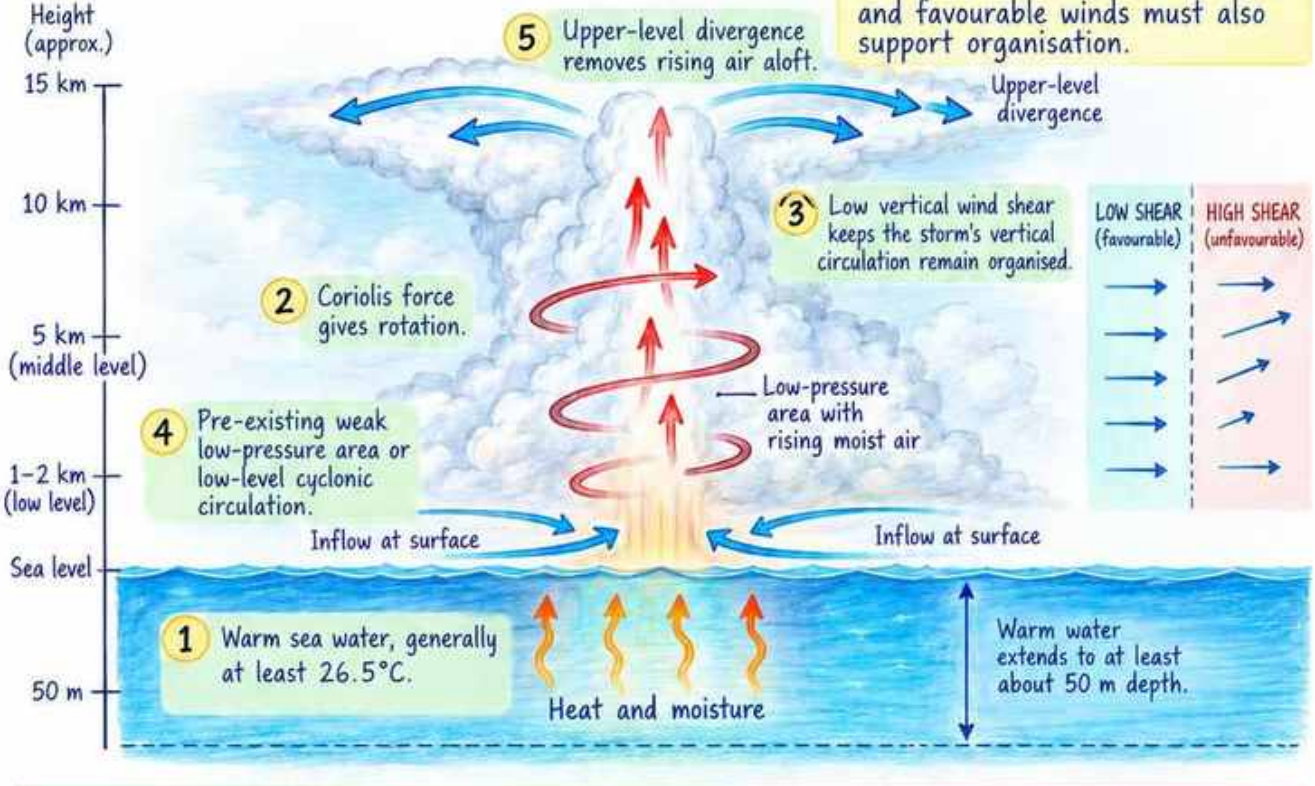
1. Warm sea water, generally at least 26.5°C. (provides heat and moisture)
2. Presence of the Coriolis force. (gives rotation)
3. Small variations in vertical wind speed: low vertical wind shear. (keeps system organised)
4. A pre-existing weak low-pressure area or low-level cyclonic circulation. (initial disturbance)
5. Upper-level divergence above the sea-level system. (removes rising air aloft)

SUPPORTING CONDITIONS

- Sea surface at least 26.5°C; warm water extends to at least about 50 m depth.
- Moist middle-level air, about 5 km above the surface.
- Vertical wind shear below about 10 m/s (20 knots).

CONDITIONS WORK TOGETHER

Warm water supplies energy, but moisture, rotation, a disturbance and favourable winds must also support organisation.



WHY NOT AT THE EQUATOR?

Coriolis force is zero at the equator. Winds flow into the low and fill it instead of intensifying the circulation.



LATITUDE AND ROTATION

Tropical cyclones generally do not form within about 5° latitude of the equator.



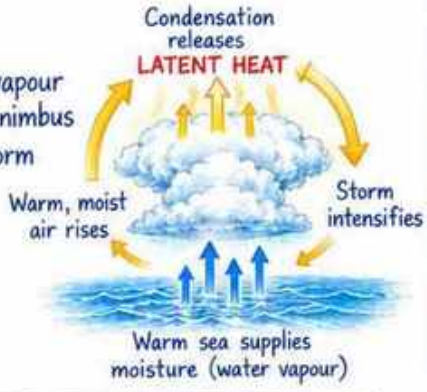
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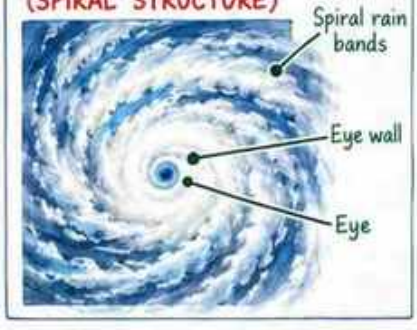
INSIDE A TROPICAL CYCLONE

THE ENERGY ENGINE

Warm sea supplies moisture → water vapour rises → condensation in towering cumulonimbus clouds releases LATENT HEAT → the storm intensifies.



OVERHEAD VIEW (SPIRAL STRUCTURE)



EYE

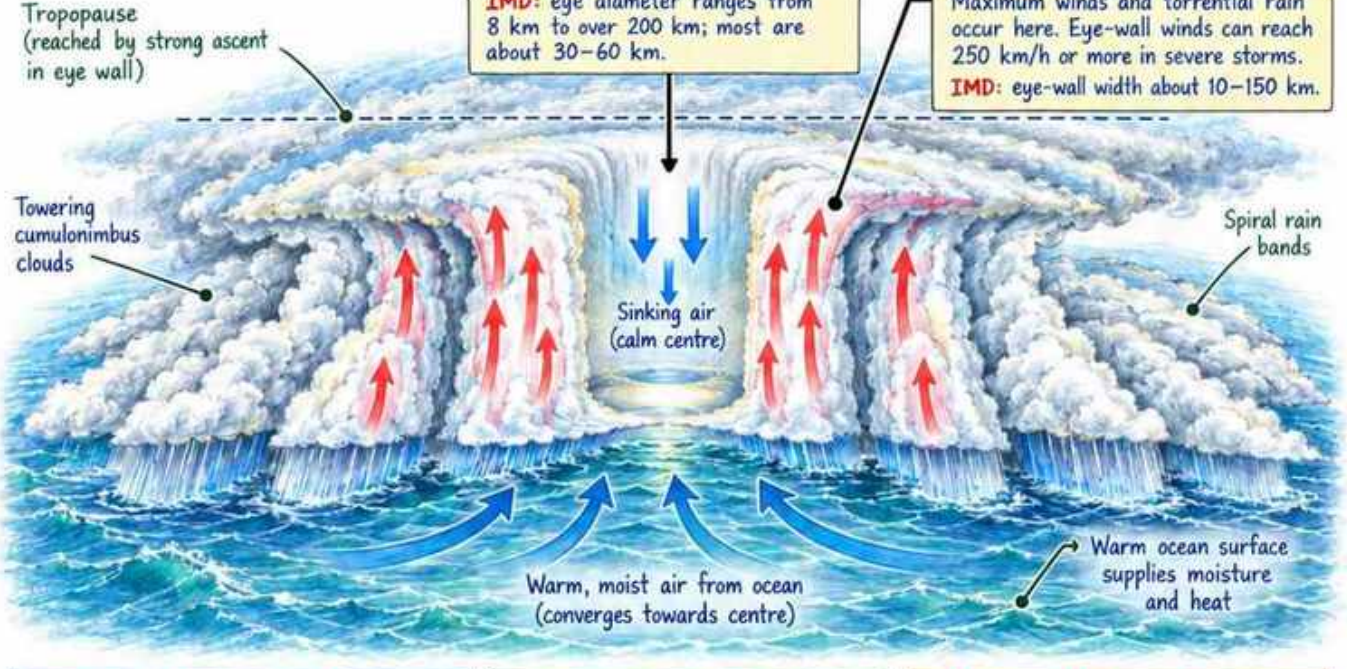
Calm centre with subsiding (sinking) air, light winds and fair weather.

IMD: eye diameter ranges from 8 km to over 200 km; most are about 30–60 km.

EYE WALL

Ring around the eye with strong spiralling ascent reaching the tropopause. Maximum winds and torrential rain occur here. Eye-wall winds can reach 250 km/h or more in severe storms.

IMD: eye-wall width about 10–150 km.



SPIRAL RAIN BANDS

Curved bands of cumulus and cumulonimbus cloud radiate outwards from the eye wall.

They bring heavy bursts of rain and wind.

MEMORY PATH

- Eye = sinking, relatively calm.
- Eye wall = strongest ascent, winds and rain.
- Rain bands = intermittent bursts around the storm.

ADDITIONAL POINTS

- Latent heat is the heat released during condensation; see Day 3, Topic 25.
- Do not place the strongest winds in the calm eye.

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LANDFALL, STORM SURGE & WEAKENING

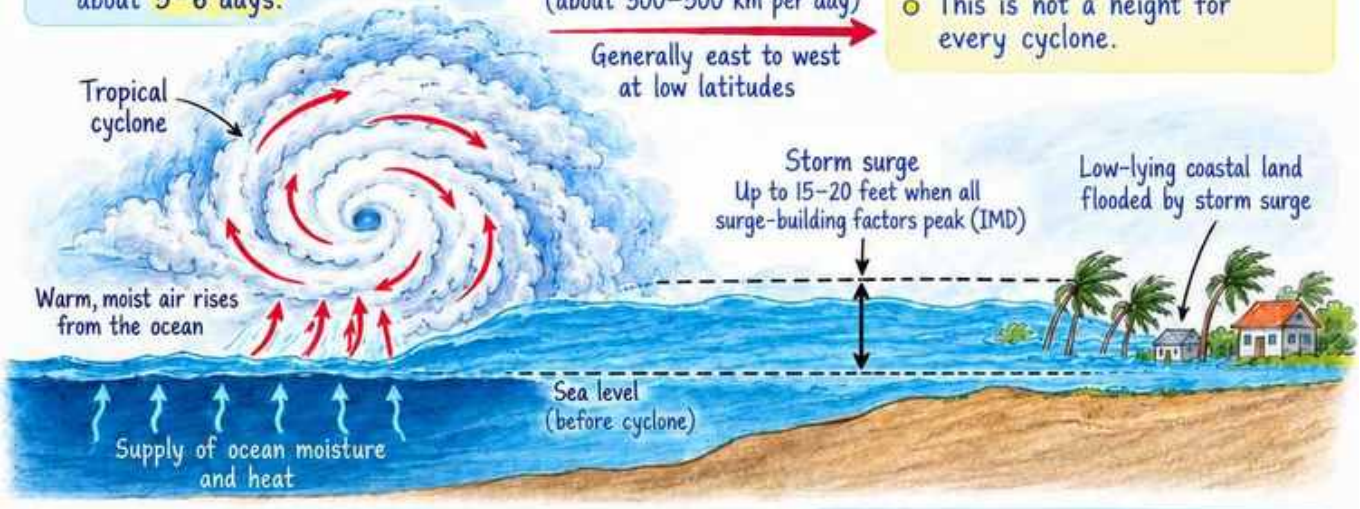
APPROXIMATE REGIONAL SCALES

- Illustrative diameter: about 600–1,200 km over the Bay of Bengal, Arabian Sea and Indian Ocean.
- Movement: about 300–500 km per day, generally east to west at low latitudes.
- North Indian Ocean life (IMD): about 5–6 days.

LANDFALL = where the tropical cyclone crosses the coast.

STORM SURGE

- An abnormal rise of sea level as the cyclone crosses the coast.
- It floods low-lying coastal land.
- IMD: a surge can reach 15–20 feet when all the surge-building factors are at their maximum.
- This is not a height for every cyclone.



WHY LAND WEAKENS THE STORM

- Over land, the supply of ocean moisture and heat is cut off → rapid weakening and dissipation.
- Friction lowers sustained winds, but gusts can increase.
- Loss of the sea's energy supply is crucial.



RECURVING

- A cyclone may turn poleward and then eastward as the steering winds change. Recurvature has no fixed 20°N boundary.



- Do not confuse movement of the whole storm with the much faster winds circulating inside it.
- Storm-surge flooding, wind damage and heavy rain are different hazards.

THREE-STAGE OCEAN/COAST/INLAND PROGRESSION

1 OVER OCEAN
(Development and intensification)



Draws warm, moist air from ocean → intensifies.

Diameter: 600–1,200 km

2 APPROACHING COAST
(Storm surge builds)



- Movement: 300–500 km per day, generally east to west (at low latitudes).
- Storm surge raises sea level (15–20 feet at maximum – IMD).

3 AFTER LANDFALL
(Weakening and dissipation)



- Supply of ocean moisture and heat cut off → rapid weakening and dissipation.
- Friction lowers sustained winds, but gusts can increase.
- North Indian Ocean life: about 5–6 days (IMD).

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REGIONAL NAMES: SAME STORM FAMILY.

CYCLONE

Tropical cyclone: Indian Ocean and South Pacific.



Tropical cyclone (Indian Ocean)

HURRICANE

Hurricane: North Atlantic, central North Pacific and eastern North Pacific.



Hurricane (Atlantic)

TYPHOON

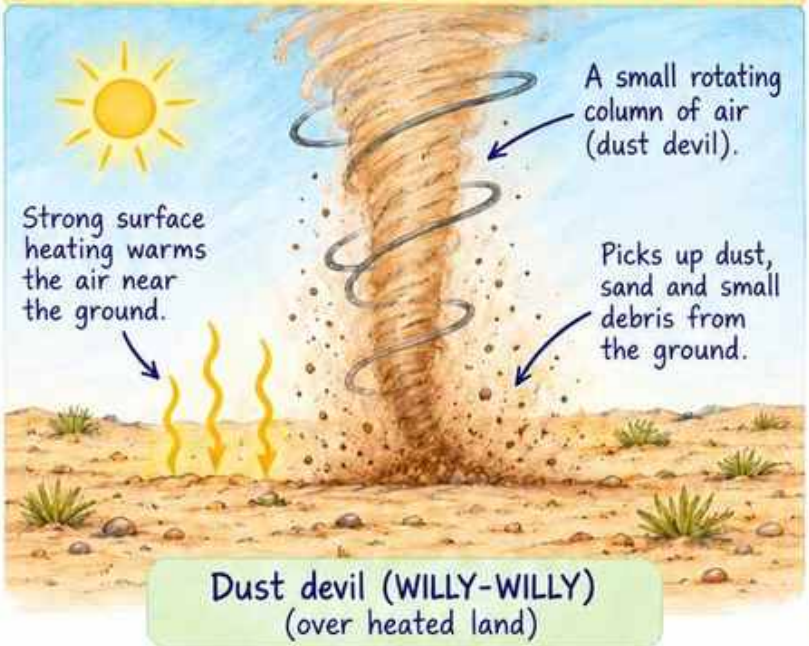
Typhoon: Northwest Pacific, including the South China Sea.



Typhoon (Western Pacific)

Cyclone, hurricane and typhoon refer to the same broad tropical-storm type; the regional terminology changes.

DUST DEVIL: A DIFFERENT PHENOMENON



Dust devil (WILLY-WILLY) (over heated land)

- A willy-willy is a dust devil: a small rotating column of air over strongly heated land.
- **WILLY-WILLY = DUST DEVIL.**
- A dust devil is a small rotating column over heated land; it is not the tropical cyclone shown in the ocean diagrams.

COMPARE THE PROCESSES

- Tropical cyclones gain energy over warm oceans; dust devils form over strongly heated land.
- Remember the Pacific split: western = typhoon; eastern and central North Pacific = hurricane.

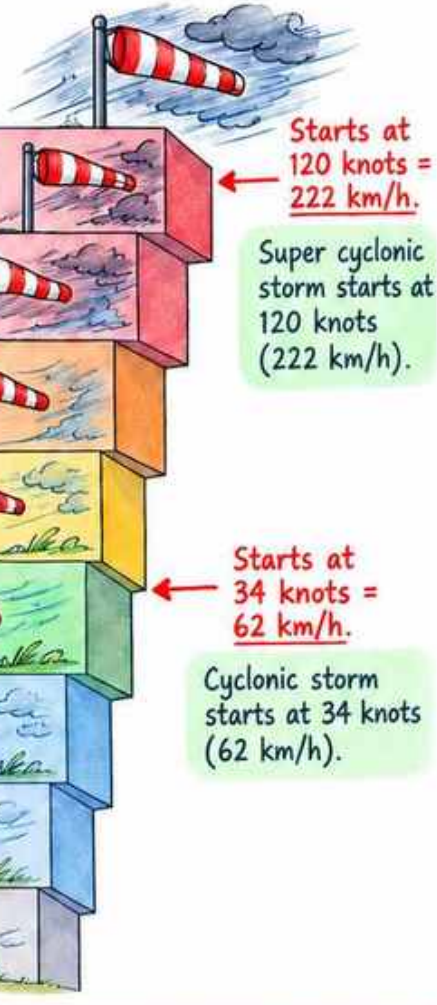
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IMD WIND-SPEED CLASSIFICATION

IMD grades low-pressure systems by **MAXIMUM SUSTAINED SURFACE WIND.**

	CATEGORY	KNOTS (maximum sustained surface wind)	km/h (maximum sustained surface wind)
8	Super cyclonic storm	120 and above	222 and above
7	Extremely severe cyclonic storm	90 – 119	167 – 221
6	Very severe cyclonic storm	64 – 89	118 – 166
5	Severe cyclonic storm	48 – 63	89 – 117
4	Cyclonic storm	34 – 47	62 – 88
3	Deep depression	28 – 33	50 – 61
2	Depression	17 – 27	31 – 49
1	Low-pressure area	less than 17	less than 31



THRESHOLDS TO REMEMBER

- Cyclonic storm starts at 34 knots = 62 km/h.
- Super cyclonic storm starts at 120 knots = 222 km/h.
- A depression and a deep depression are not yet cyclonic storms in the IMD scale.
- VERY SEVERE and EXTREMELY SEVERE are separate categories.

IMPORTANT POINTS

- Use the stated classification and units: knots and km/h.
- The category boundaries apply to maximum sustained surface wind.
- IMD grades low-pressure systems by MAXIMUM SUSTAINED SURFACE WIND.
- Do not confuse gusts with maximum sustained wind.

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NAMING & THE NORTH INDIAN OCEAN SEASONS

WHO NAMES THE STORMS?

IMD's Regional Specialised Meteorological Centre (RSMC), New Delhi names tropical cyclones over the Bay of Bengal and Arabian Sea.



WMO/ESCAP PANEL: 13 COUNTRIES

Bangladesh	India	Iran	Maldives	Myanmar	Oman	Pakistan	Qatar	Saudi Arabia	Sri Lanka	Thailand	United Arab Emirates	Yemen

- **2020 LIST:** 169 names = 13 from each country.
  First names: Nisarga → Gati → Nivar.
- Countries are alphabetical; names are used sequentially, column by column from the top.
- Used names are not reused.

NAMING PROCESS (ILLUSTRATIVE)
Down a column, then next column.

Country	List 1	List 2
Country 1 (Bangladesh)	Name 1	Name 14
Country 2 (India)	Name 2	Name 15
Country 3 (Iran)	Name 3	Name 16
⋮	⋮	⋮
Country 13 (Yemen)	Name 13	Name 26

SEASONAL RHYTHM (IMD)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

- Pre-monsoon: March – May
- Monsoon: June – September
- Post-monsoon: October – December

Primary cyclone peak: **NOVEMBER.**
Secondary peak: **MAY.**

Severe-cyclone periods in the IMD FAQ: **May – June** and **October – November.**
JUNE IS MONSOON, not pre-monsoon.

WHY MORE IN THE BAY?

Bay of Bengal : Arabian Sea cyclones ≈ **4 : 1**



1. Northwest Pacific typhoon remnants cross the South China Sea and can revive in the Bay.



2. Most Bay storms weaken over land; few reach the Arabian Sea.



3. The Arabian Sea is relatively colder, limiting formation and intensification.



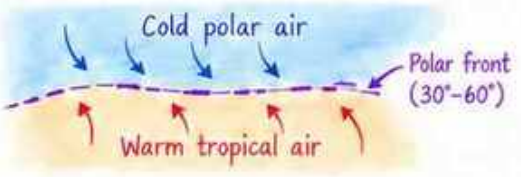
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EXTRA-TROPICAL CYCLONES: A FRONTAL LIFE CYCLE

WHERE AND WHY?

- Middle and high latitudes, along the POLAR FRONT between cold polar and warm tropical air; usual belt about 30°–60°.
- Energy comes from the temperature contrast between air masses.



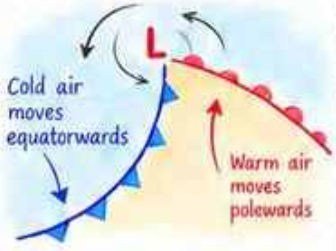
FOUR STAGES

① Stationary front



Contrasting air masses meet.

② Wave develops



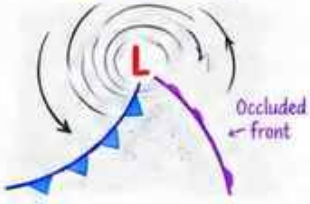
Warm air moves polewards, cold air equatorwards; cyclonic circulation begins, anticlockwise in the Northern Hemisphere.

③ Warm front + faster cold front enclose a warm sector



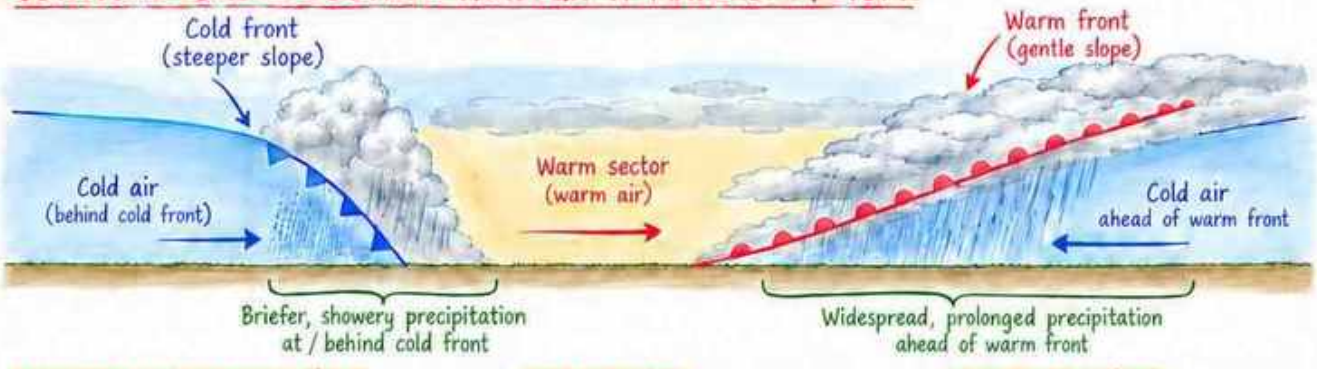
Warm front and faster cold front enclose a warm sector.

④ Cold front overtakes warm front → OCCLUSION → eventual dissipation.



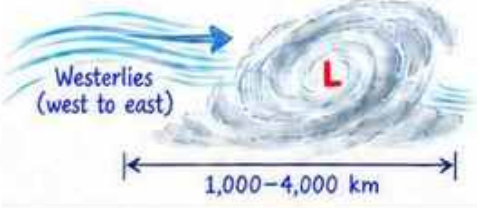
Cold front overtakes warm front → warm air lifted completely → OCCLUSION → eventual dissipation.

VERTICAL CROSS-SECTION THROUGH A MATURE SYSTEM



MOVEMENT AND SIZE

- Generally west to east, steered by westerlies.
- Forms over land as well as sea.
- About 1,000–4,000 km across; larger than tropical cyclones.



WEATHER

- Ahead of warm front: clouds thicken and lower; widespread, prolonged precipitation.
- At / behind cold front: briefer showers.
- Rain or snow can occur.



WIND CAUTION

- Often weaker than intense tropical cyclones, but there is NO 30 m/s upper limit.
- NOAA documents hurricane-force winds of at least 64 knots, about 33 m/s.



WESTERN DISTURBANCES

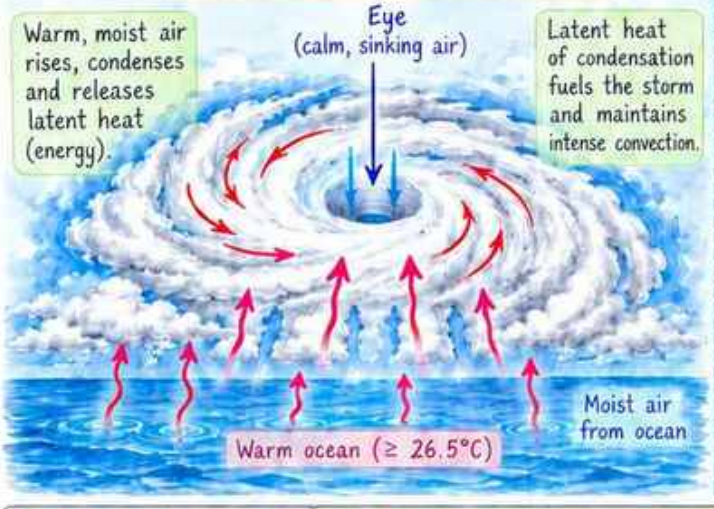
- Western disturbances bring winter rain and snow to northwest India from the Mediterranean region; see Topic 115.

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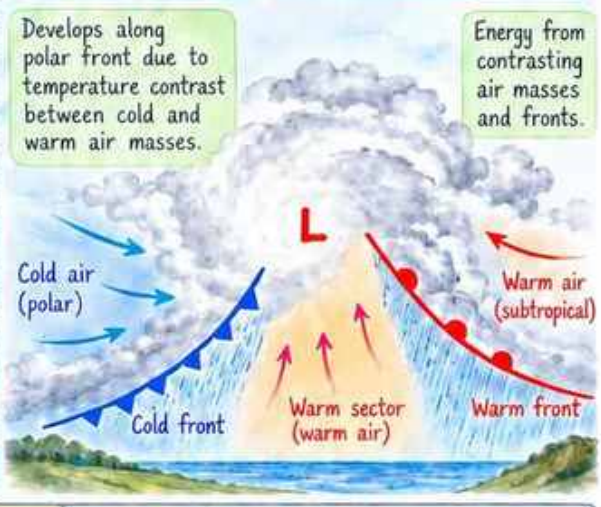
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TROPICAL vs TEMPERATE: TWO ENGINES

TROPICAL CYCLONE



TEMPERATE / EXTRA-TROPICAL CYCLONE



	TROPICAL CYCLONE	TEMPERATE / EXTRA-TROPICAL CYCLONE
1 ORIGIN	only over seas.	over land or sea.
2 LATITUDE	about 10°–25°N and S; generally not within 5° of equator.	middle/high latitudes, usually 30°–60°, along polar front.
3 ENERGY	latent heat of condensation.	temperature contrast between air masses.
4 SIZE	600–1,200 km in Indian seas.	about 1,000–4,000 km.
5 FRONTS	no frontal system.	warm front, cold front and warm sector.
6 WINDS	intense eye-wall winds, severe storms can reach 250 km/h or more.	often lower, but hurricane-force systems occur; no 30 m/s ceiling.
7 MOVEMENT	usually east to west at low latitudes; 300–500 km/day in Indian seas; may recurve as steering winds change.	usually west to east in westerlies.
8 EYE	calm centre with sinking air.	no tropical-type eye; some mature systems have an eye-like cloud-free centre.
9 LIFE	about 5–6 days in north Indian Ocean; weakens over land.	frontal life cycle ending in occlusion and dissipation.
10 RAIN	torrential eye-wall rain and rain-band bursts.	widespread steady rain ahead of warm front, briefer heavy showers at cold front.
KEY	tropical = warm sea + condensation.	temperate = contrasting air masses + fronts.

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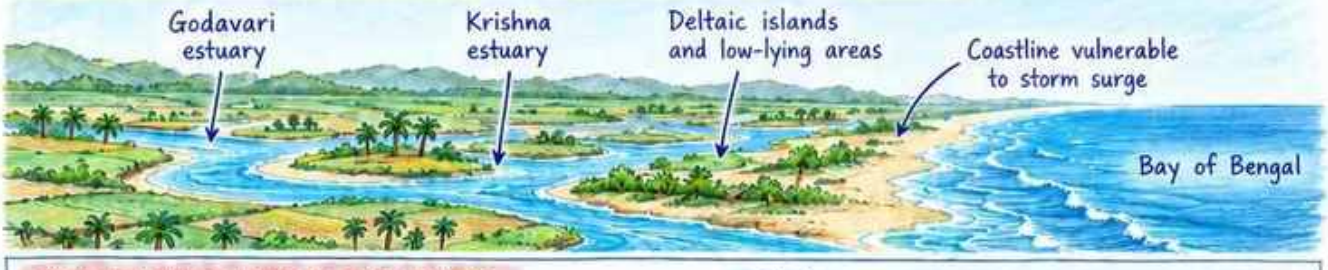
ANDHRA PRADESH: EXPOSURE & 1977.

WHY ANDHRA PRADESH IS EXPOSED

- Its coastline faces the Bay of Bengal, which has about four times as many cyclones as the Arabian Sea.



TYPICAL ANDHRA COASTAL DELTA / ESTUARY (ILLUSTRATIVE CROSS-SECTION)



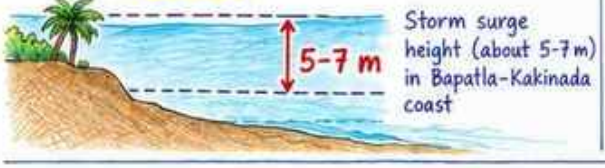
COASTLINE: READ THE DATE

- Old figure: 973.7 km, often rounded to 974 km; second among States after Gujarat.
- Revised figure: 1,053.07 km; THIRD among States after Gujarat and Tamil Nadu.
- Re-measured by the National Hydrographic Office with the Survey of India; promulgated 29 April 2025.
- Ministry of Earth Sciences report: December 2025.



IMD RISK POINTS

- Frequency of severe cyclonic storms: highest for Andhra Pradesh.
- Frequency of cyclones overall: highest for Odisha.
- Bapatla–Kakinada coast, including Krishna and Godavari estuaries: very high storm-surge risk zone, about 5–7 m.



NOVEMBER 1977 CYCLONE

- Landfall: near Chirala, 19 November 1977.
- IMD satellite-estimated maximum sustained wind: 260 km/h, above today's 222 km/h super-cyclonic threshold.
- Storm surge swept over Diviseema; the Krishna delta was worst affected.
- Historical storm descriptions and classifications introduced later refer to different classification contexts.



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HUDHUD 2014 & MICHAUNG 2023

HUDHUD: 7 – 14 OCTOBER 2014

- IMD's contemporary category: VERY SEVERE CYCLONIC STORM.
- Crossed north Andhra Pradesh over Visakhapatnam on 12 October 2014, between 1200 and 1300 hours IST.
- Estimated central pressure: 950 hPa.
- IMD: first cyclone to cross the Visakhapatnam coast in October after 1985.



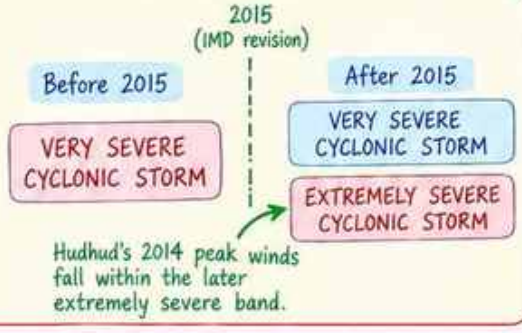
MICHAUNG: 5 DECEMBER 2023

- Category: SEVERE CYCLONIC STORM.
- Crossed the south Andhra Pradesh coast close to the south of Bapatla, between 1230 and 1430 hours IST.
- Maximum sustained wind: 90 – 100 km/h.



WHY THE CATEGORY NEEDS A DATE

- In 2015, IMD split the earlier very severe category and introduced EXTREMELY SEVERE CYCLONIC STORM.
- Hudhud's 2014 peak winds fall within the later extremely severe band.
- Hudhud's 2014 classification was "very severe cyclonic storm". Its peak winds fall in the "extremely severe" band introduced in 2015.



COMPARE CORRECTLY

Location, crossing time, wind measure and category system each matter. A change in category definitions can change the label without changing the historical wind speed.

Feature	HUDHUD (2014)	MICHAUNG (2023)	Key takeaway
Location of crossing	North Andhra Pradesh over Visakhapatnam	South Andhra Pradesh close to the south of Bapatla	Different locations on Andhra Pradesh coast.
Crossing date and time (IST)	12 October 2014 (1200 – 1300 hours)	5 December 2023 (1230 – 1430 hours)	Exact date and time matter.
Wind measure	(Peak winds fall within later extremely severe band)	Maximum sustained wind: 90 – 100 km/h	Different wind measures and magnitudes.
Category at the time	Very severe cyclonic storm (IMD's contemporary category)	Severe cyclonic storm	Category definitions depend on the year.

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MONTHA 2025: LANDFALL TO DECAY

SEVERE CYCLONIC STORM MONTHA

Crossed Andhra Pradesh and Yanam between Machilipatnam and Kalingapatnam, close to Narsapur.

LANDFALL WINDOW (IST)
2330 hours, 28 October → 0030 hours, 29 October 2025.
Sustained winds: 90–100 km/h, gusts to 110 km/h.

23:30 | 28 October 2025
LANDFALL (Severe Cyclonic Storm)
Sustained winds: 90–100 km/h
Gusts to 110 km/h

02:30 | 29 October 2025
CYCLONIC STORM (over coastal Andhra Pradesh)
Storm surge of about 0.8 m reported at Kakinada around this time.

08:30 | 29 October 2025
DEEP DEPRESSION (over coastal Andhra Pradesh and adjoining Telangana)

11:30 | 29 October 2025
About 20 km east of Bhadrachalam, moving north-north-west.
IMD expected further weakening into a depression within six hours.



AFTER LANDFALL, 29 OCTOBER 2025

- 0230 IST: weakened into a **CYCLONIC STORM** over coastal Andhra Pradesh. Storm surge of about 0.8 m reported at Kakinada around this time.
- 0830 IST: weakened into a **DEEP DEPRESSION** over coastal Andhra Pradesh and adjoining Telangana.
- 1130 IST: about 20 km east of Bhadrachalam, moving north-north-west. IMD expected further weakening into a depression within six hours.

The last statement is the bulletin's **FORECAST**, not a claim that the later weakening had already occurred.

THE PROCESS



ANDHRA CASES TO RECALL



These four cases are all October – December events.

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INDIA'S SIX PHYSICAL DIVISIONS

ONE LAND, SIX MAJOR DIVISIONS

Six broad physical divisions:

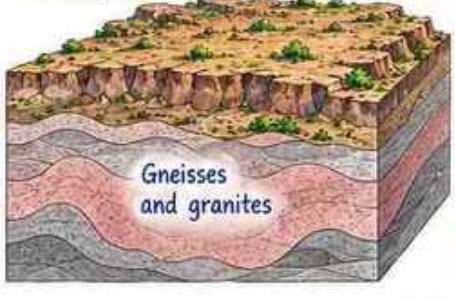
1. Himalayan Mountains.
2. Northern Plains.
3. Peninsular Plateau.
4. Indian Desert.
5. Coastal Plains.
6. Islands.

The mountain division includes the northern Himalayan ranges and the north-eastern hills.

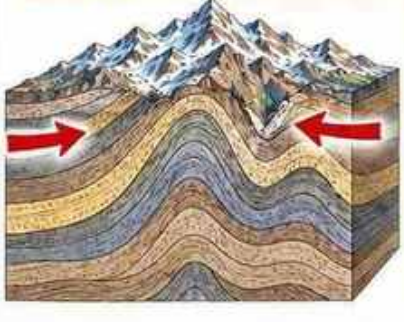


THREE CONTRASTING ORIGINS

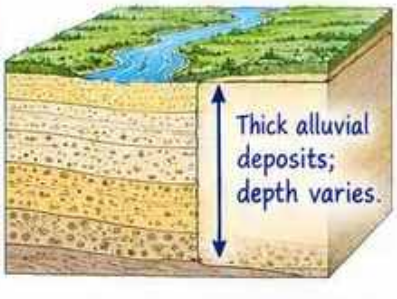
PENINSULAR PLATEAU:
An ancient continental block associated with the breakup and drift of Gondwana. Ancient gneisses and granites form much of its foundation. Relative stability does not mean an absence of uplift, faulting or volcanic activity.



HIMALAYAS:
geologically young fold mountains in an unstable zone. Their high relief forms a barrier between the Tibetan Plateau to the north and the subcontinent's plains to the south.



NORTHERN PLAINS:
Built by alluvium deposited by the Indus, Ganga, Brahmaputra and their tributaries. The sediment fill can be very thick; its thickness varies across the basin.



HOW TO STUDY THIS TOPIC

For every range, plateau, peak, pass, coastal stretch or island group, connect the name to its parent physical division, position and distinguisshing feature.

READ LANDFORMS AT TWO SCALES

A broad physical division contains smaller regions. Length, width, elevation and sediment thickness describe different features and vary across a landform.

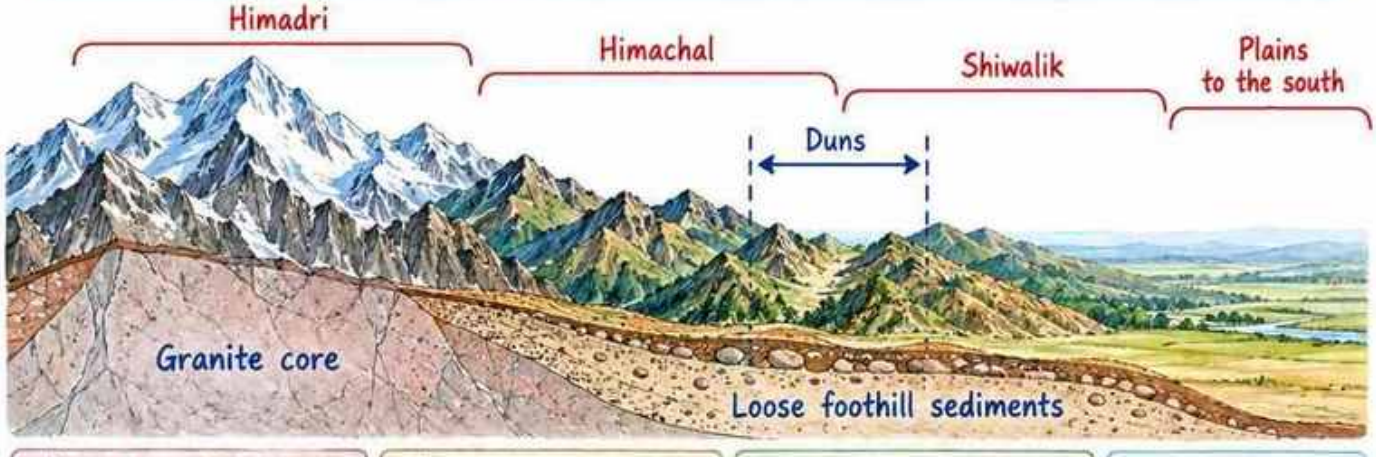
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HIMALAYAN RANGES: NORTH TO SOUTH

HIMALAYAN ARC

The Himalayan arc stretches approximately 2,400 km from the Indus to the Brahmaputra. Its width varies from about 400 km in Kashmir to 150 km in Arunachal Pradesh. These are approximate dimensions; width changes along the mountain system.



HIMADRI • GREAT OR INNER HIMALAYA

Nonthernmost and most continuous range.

Average height about 6,000 m.

Granite core; perennial snow and many descending glaciers.



HIMACHAL • LESSER HIMALAYA

Height about 3,700–4,500 m; average width about 50 km. Pir Panjal is the longest and most important range here. Dhaula Dhar and Mahabharat are also prominent.

Kashmir, Kangra and Kullu valleys are associated with this Himalayan belt.



SHIWALIK • OUTERMOST RANGE

Height about 900–1,100 m; width about 10–50 km.

Built of unconsolidated sediments carried down by rivers from the main Himalayan ranges farther north.



DUNS

Longitudinal valleys between Himachal and Shiwalik, such as Dehra Dun, Kotli Dun and Patli Dun.



ORDER CHECK

North → Himadri → Himachal → Shiwalik → plains to the south

Do not confuse a range's altitude with its width, or the parallel north-south arrangement with the river-bounded west-east regional divisions.

Sources: S1, S2.

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REGIONAL HIMALAYAS & THE EASTERN HILLS

A DIFFERENT WAY TO DIVIDE THE HIMALAYAS

Parallel ranges describe north-south belts.
Regional divisions describe successive stretches from west to east, bounded by rivers.

PUNJAB HIMALAYA
Between the Indus and the Satluj.

KUMAON HIMALAYA
Between the Satluj and the Kali.

NEPAL HIMALAYA
Between the Kali and the Teesta.

ASSAM HIMALAYA
Between the Teesta and the Dihang.



READ THE CHAIN

Indus → Punjab → Satluj → Kumaon → Kali → Nepal → Teesta → Assam → Dihang

A boundary river separates neighbouring stretches; it should not be silently shifted into the wrong pair.

EASTERN END

In this river-bounded regional division, the Brahmaputra-Dihang marks the eastern end of the Himalayan arc. Beyond the Dihang gorge, the mountains bend southward along India's eastern margin.



PURVACHAL • EASTERN HILLS

Patkai hills • Naga hills • Manipur hills • Mizo hills.
Mostly sandstone, a sedimentary rock; densely forested.



IMPORTANT NORTH-EASTERN DISTINCTION

Purvachal belongs to the Himalayan mountain system.



The Garo, Khasi and Jaintia hills belong to the Meghalaya extension of the ancient Peninsular Plateau.



Being located in north-eastern India does not make all hills part of the same geological division.

EXAM CHECK In this river-bounded division, Kumaon is the stretch between the Satluj and Kali.

Sources: S1, S2.

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NORTHERN PLAINS: RIVERS, REGIONS & DIMENSIONS

BUILT BY THREE GREAT RIVER SYSTEMS

The Indus, Ganga and Brahmaputra, with their tributaries, deposit alluvium across the Northern Plains.



APPROXIMATE REGIONAL DIMENSIONS

Area: about 7 lakh sq km.
Length: about 2,400 km.
Breadth: about 240–320 km.
The extent depends on the regional boundary used.



THREE DIFFERENT MEASUREMENTS

Length: distance along the plains.
Width: distance across them.
Elevation: height above mean sea level.
These measurements vary with location and the regional boundary used.



READING DIMENSIONS: Approximate regional dimensions describe a broad landform, not a uniform rectangle. Local width and elevation vary.

PUNJAB PLAINS

Western part, formed by the Indus and tributaries. The larger part lies in Pakistan.

DOAB

Land between two rivers: do means two, ab means water. This is an inter-river area, not the name of a single river or a soil type.

GANGA PLAIN

Between the Ghaggar and Teesta; extends across Haryana, Delhi, Uttar Pradesh, Bihar, part of Jharkhand and West Bengal.

BRAHMAPUTRA PLAIN

The Assam valley forms the Brahmaputra division of these plains.



NEXT LEVEL OF CLASSIFICATION

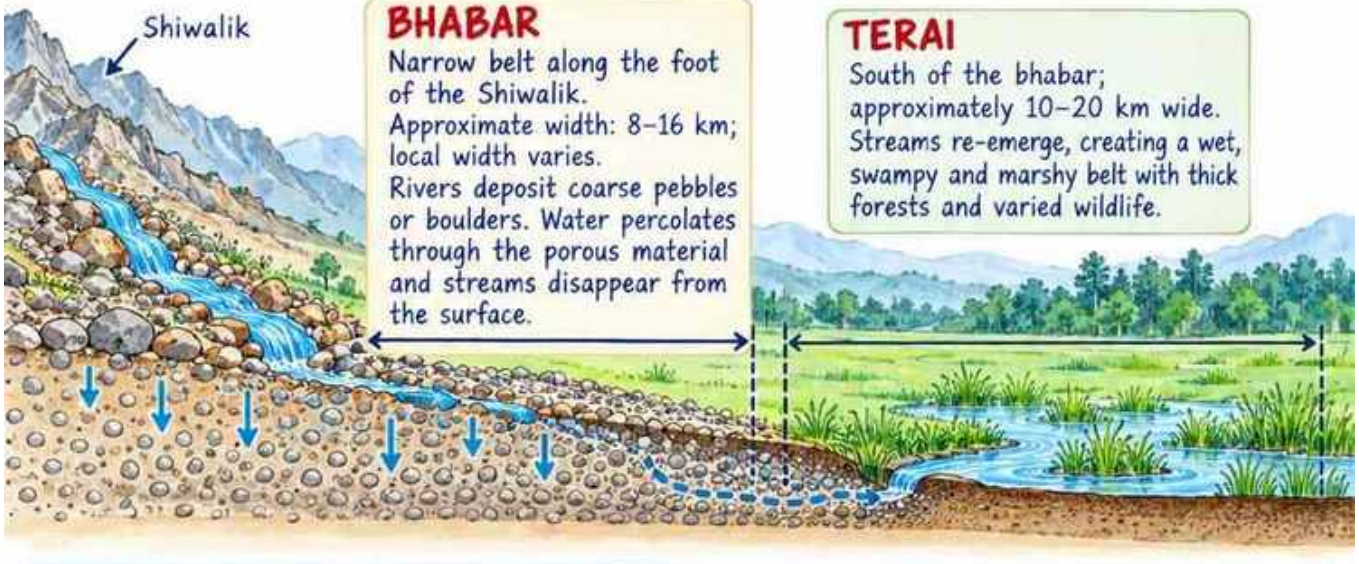
Punjab, Ganga and Brahmaputra are broad regional divisions. Sources: S1, S2.
Bhabar, terai, bhangar and khadar describe different depositional or relief characteristics within the plains.

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BHABAR, TERAI, BHANGAR & KHADAR

FOLLOW WATER FROM THE FOOTHILLS



BHABAR

Narrow belt along the foot of the Shiwalik.
Approximate width: 8–16 km; local width varies.
Rivers deposit coarse pebbles or boulders. Water percolates through the porous material and streams disappear from the surface.

TERAI

South of the bhabar; approximately 10–20 km wide.
Streams re-emerge, creating a wet, swampy and marshy belt with thick forests and varied wildlife.

FOLLOW THE AGE OF ALLUVIUM



BHANGAR

Older alluvium standing above the active floodplain like a terrace.
Contains calcareous deposits called kankar.

KHADAR

Younger floodplain alluvium, frequently renewed by fresh flood deposits and generally fertile.

TWO COMPARISONS, NOT ONE SIMPLE FOUR-STEP LADDER

Bhabar versus terai emphasises coarse foothill deposits, infiltration and re-emergence.

Bhangar versus khadar emphasises older terraces and younger floodplain deposits.

EXAM CHECK

Disappearing streams → bhabar.
Re-emerging streams and marshes → terai.
Older terrace with kankar → bhangar.
New, frequently renewed floodplain → khadar.

Do not attach terai's wet-surface feature to bhabar or exchange the ages of bhangar and khadar.

Sources: S1, S2.

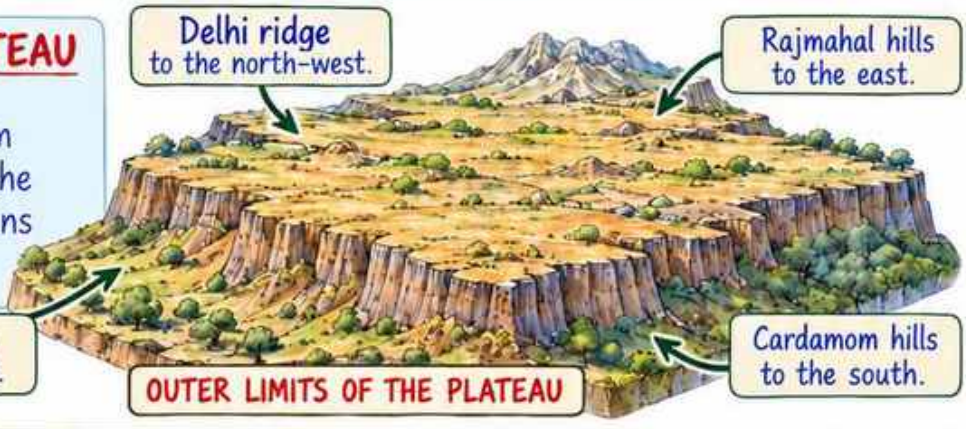
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PENINSULAR PLATEAU & CENTRAL HIGHLANDS

PENINSULAR PLATEAU

The plateau rises from roughly 150 m above the river plains to elevations around 600–900 m.



TWO LEVELS OF REGIONAL GROUPING

Broad division:
Central Highlands + Deccan Plateau.

Detailed division:
Deccan Plateau + Central Highlands + North-eastern Plateau.

These are alternative levels of description within the same large physical division.

CENTRAL HIGHLANDS

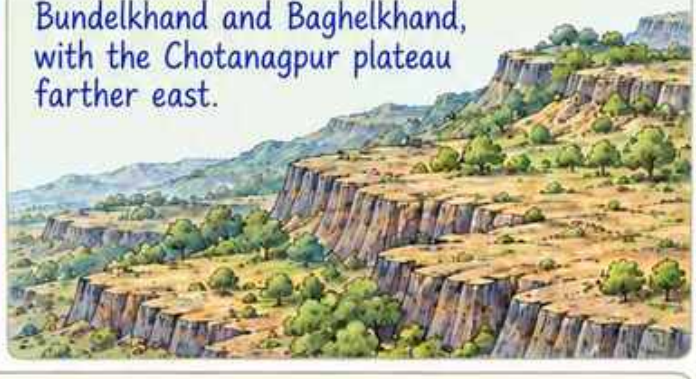
The plateau north of the Narmada includes a major part of the Malwa plateau.

The Vindhyan range belongs here; the Satpura is to its south and the Aravalis to the north-west.

The Central Highlands generally lie about 700–1,000 m above mean sea level; the Aravalis form their western margin.

EASTWARD EXTENSIONS

Bundelkhand and Baghelkhand, with the Chotanagpur plateau farther east.



RANGE CHECK



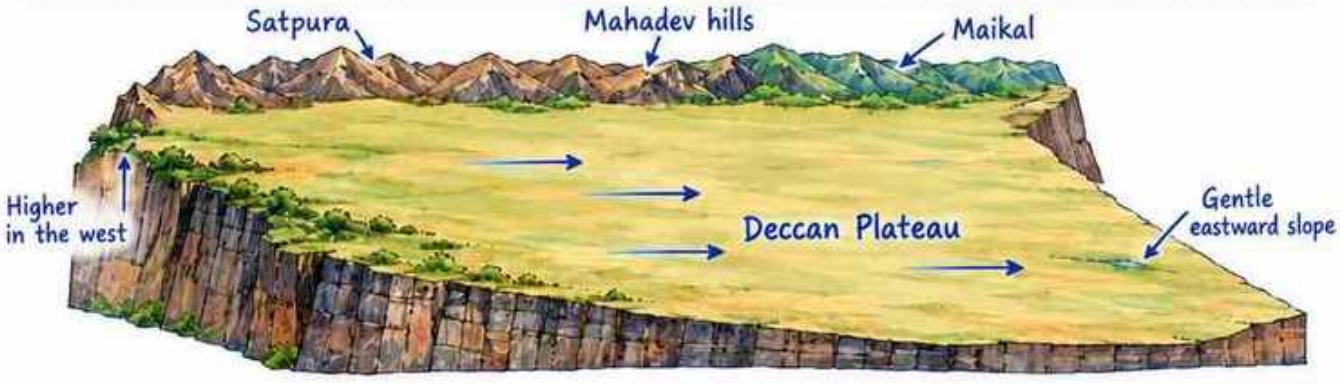
Aravali → north-western side of Central Highlands; desert lies farther west.

Vindhyan → Central Highlands, north of the Narmada.

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DECCAN, SATPURA–MAIKAL & NORTH-EASTERN PLATEAU



DECCAN PLATEAU

Triangular plateau south of the Narmada. Higher in the west, with a gentle eastward slope.

REGIONAL BOUNDARIES

A range can form the margin between neighbouring plateau regions.
The Narmada separates the broad Central Highlands to the north from the Deccan Plateau to the south.
Maikal belongs to the eastern part of this northern Deccan margin.

DECCAN TRAP

Volcanic-origin terrain associated with the black-soil region.
Soil detail was covered in Topic 66.



SATPURA & NORTHERN BORDER

Satpura, Mahadev and Maikal mark the broad northern margin of the Deccan Plateau. The Satpura system lies south of the Narmada. Its relief is varied; regional elevations and individual summit heights are different measurements.

NORTH-EASTERN PLATEAU

Meghalaya and Karbi Anglong are extensions of the Peninsular Plateau, separated from Chotanagpur by the Malda fault in West Bengal.



MEGHALAYA HILLS

Garo • Khasi • Jaintia.



These ancient plateau hills are not the Purvachal's Patkai–Naga–Manipur–Mizo mountain group.

EXAM CHECK

Location in the north-east does not by itself determine geological origin or physical division.



Sources: S1, S2.

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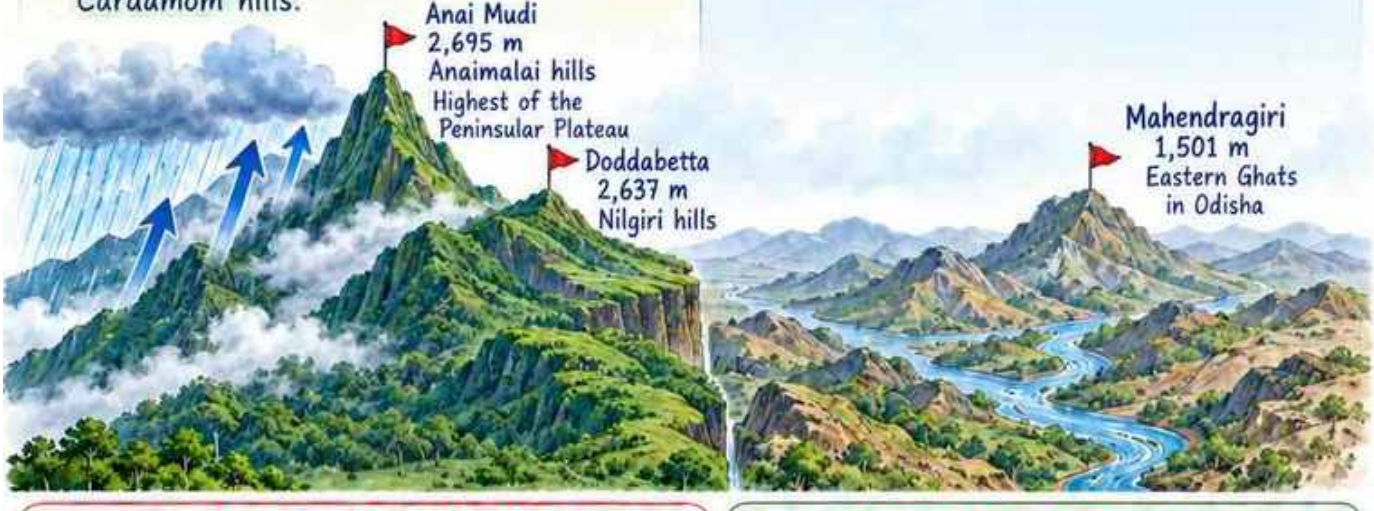
WESTERN GHATS & EASTERN GHATS

WESTERN GHATS

- Western edge of the Deccan Plateau; relatively continuous.
- Passes provide routes across the range; moist air rising over the slopes produces orographic rainfall.
- Regional elevations vary, with many sections roughly 900–1,600 m high; individual peaks rise higher. Heights generally increase from north to south.
- Local names include Sahyadri in Maharashtra, Nilgiri, Anaimalai and Cardamom hills.

EASTERN GHATS

- Eastern edge, from the Mahanadi valley towards the Nilgiris.
- Discontinuous, irregular, low and highly eroded; major rivers cut across them.
- Average height about 600 m.
- Ranges include Javadi, Palakonda. Nallamala and Mahendragiri.



NAMED PEAKS & THEIR LOCATIONS

- Jindhagada: about 1,690 m, Andhra Pradesh.
- Mahendragiri: about 1,501 m, Odisha.
- Meesapulimala: about 2,640 m, Kerala.
- Doddabetta: about 2,637 m, Nilgiri hills.
- A peak's height and location are distinct from a ranking within a specified mountain region.

THE EASTERN AND WESTERN GHATS MEET IN THE NILGIRI HILLS.

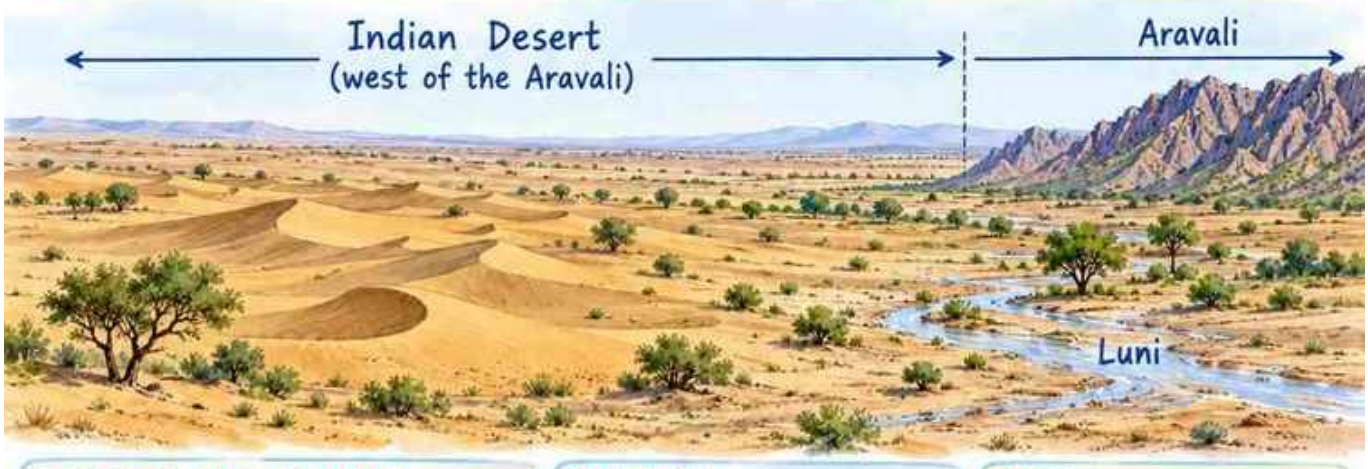


Sources: S1, S2; A1, A2, A6.

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THE INDIAN DESERT: DUNES & TEMPORARY STREAMS



WEST OF THE ARAVALI

The Great Indian Desert, or Marusthali, lies west of the Aravali. Much of its surface is an undulating sandy plain with sand dunes.

RAINFALL

Rainfall is scarce and irregular. Aridity shapes the landscape, while rainfall totals vary from place to place and from year to year.

LUNI

A major river of the southern desert region. Its flow and the surrounding landscape reflect the region's scarce and irregular rainfall.

BARCHANS

Crescent-shaped sand dunes. The term describes a dune's shape, not a river or a rock type.



LONGITUDINAL DUNES

Elongated dunes occur prominently near the India–Pakistan border. Their long ridges differ from the crescent shape of barchans.



EPHEMERAL STREAMS

Most other streams flow only briefly following rainfall. Ephemeral means temporary flow; it does not mean a permanently flowing river hidden beneath every dune.



CONNECT LOCATION AND PROCESS

Aravali to the east → sandy desert landscape → scarce rain → temporary streams and dune forms

EXAM CHECK

Do not place the desert east of the Aravali, confuse the Luni with the Ganga-system plains, or define a barchan as a longitudinal dune.

Sources: S1, S2.

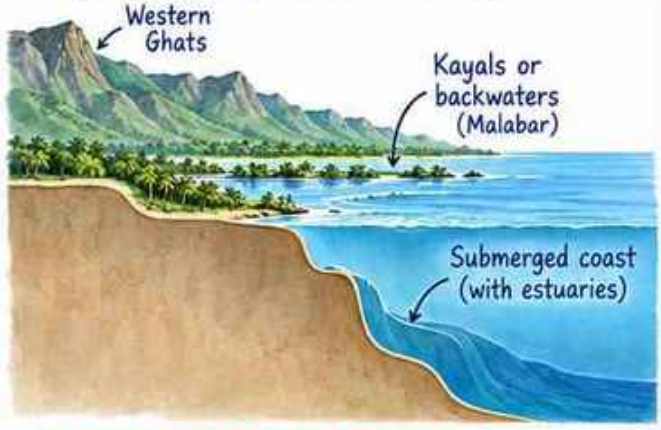
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COASTAL PLAINS: TWO DIFFERENT MARGINS

WESTERN COAST • NARROWER

Between the Western Ghats and the sea. Much of the west coast has submergent features and estuaries; the broad river deltas characteristic of the east are less prominent. Malabar has kayals or backwaters.



BROAD WESTERN STRETCHES

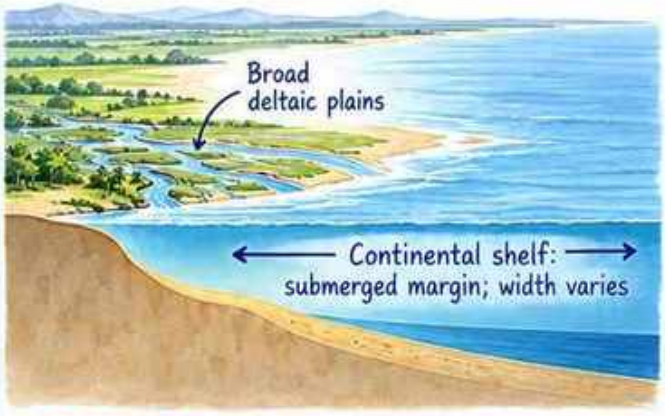
Konkan: Mumbai to Goa.
Kannada plain: central stretch.
Malabar coast: southern stretch.

COASTAL LANDFORMS

Estuary: a tidal river mouth where river water and seawater mix. Lagoon: shallow coastal water partly separated from the sea by a barrier. Regional names and landform types answer different questions.

EASTERN COAST • BROADER

Broad deltaic plains characterise much of the eastern coast. The continental shelf is the submerged, gently sloping margin beyond the shoreline; its width varies along the coast.



EASTERN COAST NAMES

Northern Circars in the north;
Coromandel coast in the south.

MAJOR DELTAS

Mahanadi • Godavari • Krishna • Kaveri.

LAKE CHECK

Chilika lies in Odisha, south of the Mahanadi delta. It is a brackish coastal lagoon, where freshwater and seawater mix.


Chilika
Brackish coastal lagoon

Pulicat is brackish-water.


Pulicat
Brackish-water

Kolleru is freshwater.


Kolleru
Freshwater

EXAM TRAP

A coastal location alone does not make every lake salty. Nor is Konkan the southern stretch of the western coastal plain.

Sources: S1, S2, S14; A7.

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ISLANDS: CORAL, SUBMARINE RELIEF & CHANNELS

LAKSHADWEEP • ARABIAN SEA

- Off the Kerala coast; coral deposits form the islands.
- 36 islands; total area about 32 sq km.
- October 2026 administrative-profile count: 10 inhabited islands. Inhabited islands are a different category from the total island group.
- Earlier names: Laccadive, Minicoy and Amindive islands. Renamed Lakshadweep in 1973.
- Kavaratti is the administrative headquarters.
- Pitti is uninhabited and has a bird sanctuary.



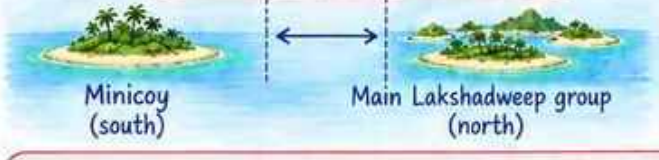
ANDAMAN & NICOBAR • BAY OF BENGAL

- The islands rise from submarine mountain relief.
- The October 2026 administrative-profile total is 836 islands, islets and rocky outcrops, This total is broader than a count of inhabited islands.
- BARREN ISLAND
  India's only active volcano.
- SADDLE PEAK
  738 m, North Andaman; Elevation describes the height of the summit above mean sea level.



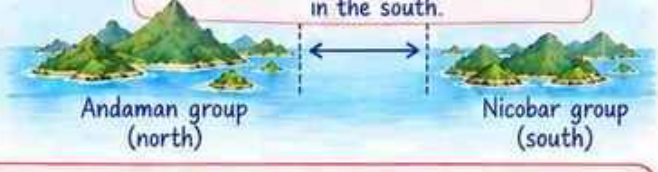
NINE DEGREE CHANNEL

Divides Minicoy from the main Lakshadweep group to its north.



TEN DEGREE CHANNEL

Separates the Andaman group in the north from the Nicobar group in the south.



EXAM CHECK

Coral origin → Lakshadweep.	Submarine mountain relief → Andaman and Nicobar.	Nine degree → Lakshadweep division.	Ten degree → Andaman–Nicobar separation.

Island counts depend on what is counted: inhabited islands, all islands and islets, or rocky outcrops as well. Seas, geological origins and dividing channels describe different features.

Sources: S1, S2; A3, A4.

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ANDHRA PRADESH: THREE PHYSICAL REGIONS

THREE GEOGRAPHICAL ZONES

Andhra Pradesh has three broad physical regions: the eastern coastal plains, the Eastern Ghats and the interior Deccan Plateau. These are landform regions, not administrative divisions.

COASTAL PLAINS

Old coastline measurement: **973.7 km.**

Revised coastline measurement: **1,053.07 km (2025).** See Topic 125.

Godavari and Krishna deltas connect this region to Topic 45.



EASTERN GHATS

The southern Eastern Ghats include the Nallamala, Erramala, Seshachalam, Velikonda and Palakonda hills. Rivers and gaps interrupt the hill belt.



Hill ranges, river valleys and coastal plains form a connected landscape; this schematic is not a scale map.

RIVER LINKS



PLATEAU

Parts of the interior plateau have granitic rocks, sandy soils and scrub.

Red soils occur in Rayalaseema and coastal districts; see Topic 66.



FURTHER STUDY

State physical divisions: Topic **295**.
Eastern Ghats in Andhra Pradesh: Topic **616**.

Sources:
S13, S14; A8.

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HIMALAYAN PEAKS: HEIGHTS & LOCATIONS

READ HEIGHT AND LOCATION SEPARATELY

Elevation measures height above mean sea level. A summit can lie on an international border; territorial claims and present administration are different descriptions.

EVEREST



Jointly announced in 2020: 8,848.86 m, rounded to 8,849 m.

Location: Nepal–China border, adjoining Tibet.

KANCHENJUNGA



Height: 8,586 m.

Location: Sikkim–Nepal border.

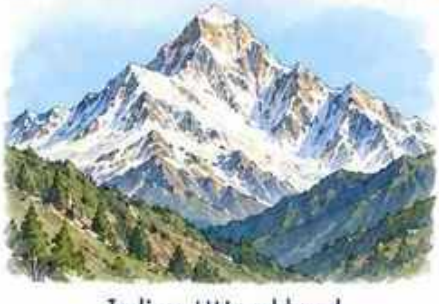
NANGA PARBAT • 8,126 m



Gilgit-Baltistan, administered by Pakistan and claimed by India as part of the former princely state of Jammu and Kashmir.

Territorial claims and present administration are distinct.

NANDA DEVI • 7,817 m



India; Uttarakhand.

KAMET • 7,756 m



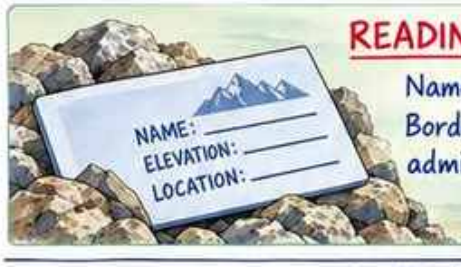
India; Uttarakhand.

NAMCHA BARWA



Height: 7,782 m.

Location: Tibet Autonomous Region, China.



READING A PEAK PROFILE

Name → summit elevation → geographic location. Border position, territorial claim and present administration must be distinguished.

Sources: S1, S16, S17; A5, A9–A12.

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IMPORTANT PASSES: RANGE, PLACE & CONNECTION

KARAKORAM PASS

Karakoram Range, Ladakh; connects the Depsang Plains route with Xinjiang.



ZOJI LA

Between the Kashmir Valley and Ladakh's Dras side, on the Ganderbal–Kargil district boundary. The route continues through Dras and Kargil towards Leh; avoid treating it as a direct crossing into every Ladakh valley.



SHIPKI LA

Kinnaur district, Himachal Pradesh, on the Tibet border. The Satluj enters India near this area.



NATHU LA

Dongkya range, Sikkim–Tibet border; links Sikkim with the Chumbi valley.



BOMDI LA

Near Bomdila, headquarters of West Kameng district, Arunachal Pradesh.



PALGHAT GAP

Western Ghats between Kerala and Tamil Nadu. Nilgiri hills to the north; Anaimalai hills to the south. About 32 km wide. Road and rail connect Palakkad and Coimbatore.



BHOR GHAT

Western Ghats or Sahyadri, Maharashtra; road crossing between Khopoli and Khandala.



THAL GHAT

Western Ghats near Kasara, Maharashtra; carries the Mumbai–Nashik road and railway.



HOW TO REMEMBER



- For each pass attach three labels: mountain system, state or border, and the places connected.
- A pass is a crossing through a mountain barrier; Ghats are the mountain ranges themselves.
- These are location notes, not an assurance of current travel access or road conditions.

Sources: S4–S12, S15; A13–A16.

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Read the ocean floor

Ocean relief means the shape of the floor beneath the water. Tectonic movement, volcanism and sediment deposition create its mountains, plains and trenches.

Much of the ocean floor lies roughly **3–6 km** below sea level.

Mean ocean depth is about **3,682 m**; a mean is different from a depth range.

Major divisions and smaller features

Four major divisions

1. Continental shelf
2. Continental slope
3. Deep sea plain
4. Oceanic deeps or trenches

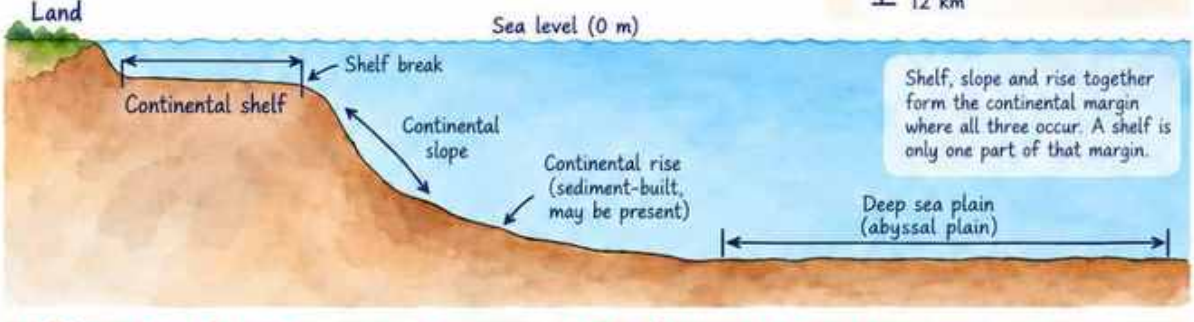
Five minor features

1. Mid-oceanic ridges
2. Seamounts
3. Submarine canyons
4. Guyots
5. Atolls

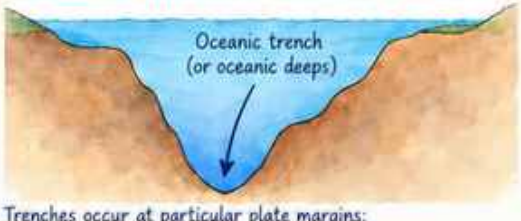
Depth guide (below sea level)



Generic ocean floor profile (schematic, not to scale)



Subduction trench (at a particular plate margin)



Trenches occur at particular plate margins; every cross-section does not contain every feature. The deep sea plain is especially flat, while trenches are deepest.

Minor features (schematic sketches, not to scale)



- **Mid-oceanic ridges:** Underwater mountain chains formed by volcanism.
- **Seamounts:** Isolated volcanic mountains rising from the seafloor (but not to sea level).
- **Submarine canyons:** Deep valleys cut into continental shelves and slopes.
- **Guyots:** Flat-topped seamounts (older, eroded volcanoes).
- **Atolls:** Ring-shaped reefs, usually formed on or around sunken volcanoes.

Reading the profile

Read the profile from land to a shelf, then a steeper slope and a deep basin. A sediment-built continental rise may lie between slope and plain. This is a schematic route, not a compulsory sequence.

Distinguish three measurements

- Depth below sea level (vertical distance downward).
- Height above the local seabed (vertical distance upward).
- Horizontal width (distance along the seafloor).

Topic link Topic 116 introduced the oceans; this topic explains their floors.

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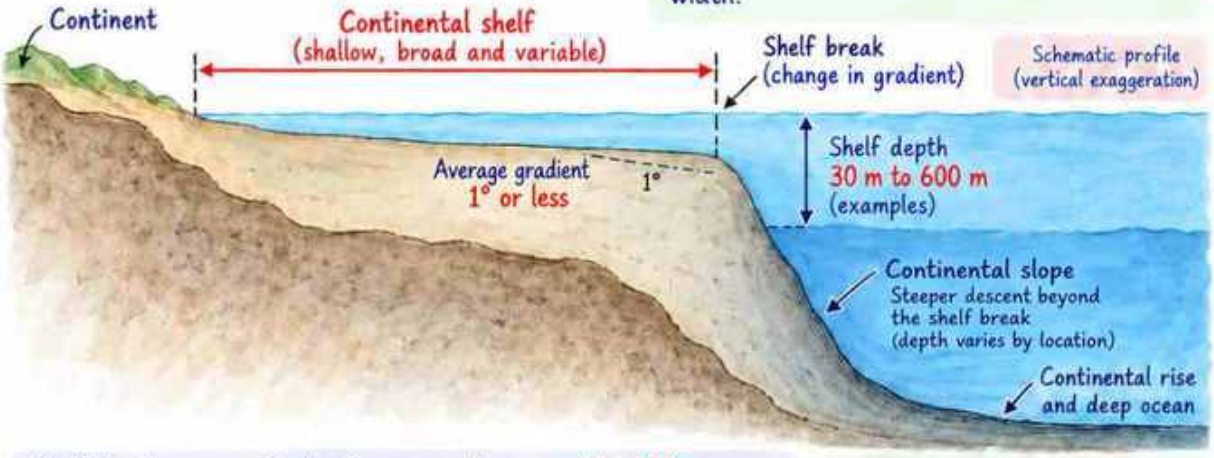
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Continental shelf: shallow, broad and variable

The continental shelf is the submerged extension of a continent, occupied by relatively shallow seas and gulfs. It ends where the sea floor becomes markedly steeper: the shelf break.

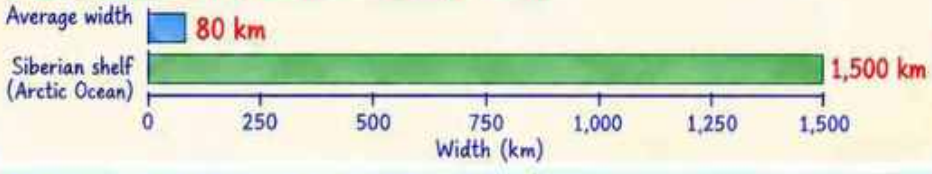
Continental shelves are gently sloping, commonly 1° or less, with an average width of about 80 km. Width varies greatly. Shelves are almost absent or very narrow along some coasts, including Chile on the Pacific coast of South America. The broad Siberian shelf in the Arctic Ocean reaches about 1,500 km in width.



Shelf depths vary: illustrative examples span 30–600 m. These values describe different locations, not a universal depth band. The shelf break is a marked change in gradient; its depth is not fixed globally at 200 m.

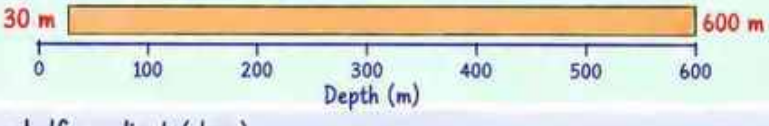
Rivers, glaciers and wind supply sediment of variable thickness. Long accumulation of sedimentary deposits helps explain offshore fossil-fuel resources.

Continental shelf width: comparison



Width varies greatly. Shelves are almost absent or very narrow along some coasts, including Chile on the Pacific coast of South America.

Illustrative shelf depths at different locations



These depths illustrate different locations, not a universal band.

Average shelf gradient (slope)



A gentle shelf gradient is commonly 1° or less.

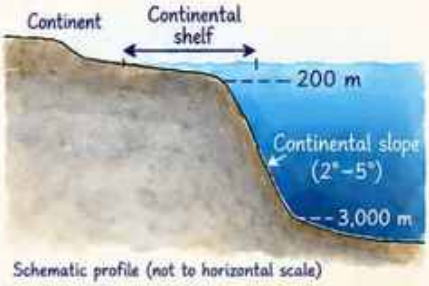
Sources: S1

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Slope, plain and trench: three different measures

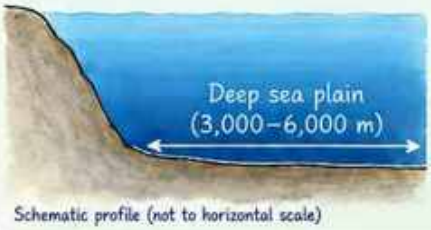
1. Continental slope



Schematic profile (not to horizontal scale)

- The continental slope connects the shelf to the ocean basin.
- An illustrative range is a gradient of 2°–5° and depths of 200–3,000 m.
- The slope forms the transition from the continental shelf towards the deep ocean basin.
- Canyons and trenches can occur in this region.

2. Deep sea plain



Schematic profile (not to horizontal scale)

- A broad depth range for deep sea plains is 3,000–6,000 m.
- Fine clay and silt cover these gently sloping, extremely flat regions.
- "Flattest" does not mean "deepest".

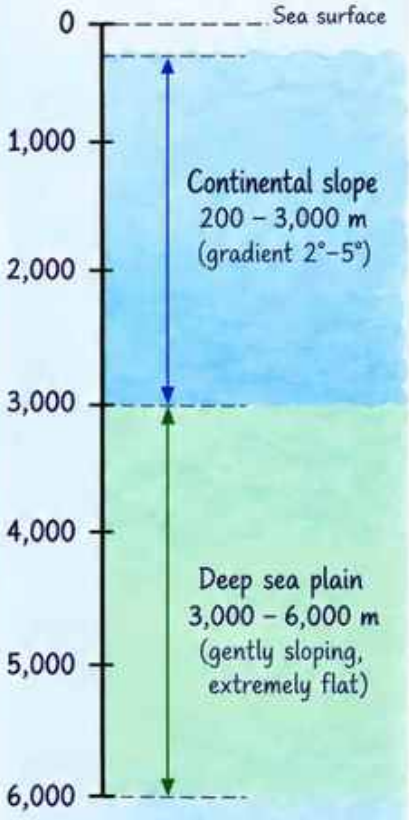
3. Oceanic deeps or trenches



Schematic profile (not to horizontal scale)

- Oceanic deeps or trenches are narrow, steep-sided basins, associated with active volcanoes and strong earthquakes.
- They occur at continental-slope bases and along island arcs.
- The 3–5 km figure shown is depth below the surrounding ocean floor. It is relative relief, not depth below sea level.
- Many trenches mark convergent boundaries where one plate descends beneath another.
- Subduction is not a required last stage of every ocean-floor profile.

Illustrative depth ranges (below sea level)



ABSOLUTE DEPTH ≠ RELATIVE RELIEF

Depth below sea level
Measured from the sea surface to the seabed.



Depth below surrounding seabed
Measured from the nearby ocean floor to the trench floor.

Illustrative example: surrounding seabed 6 km below sea level + trench relief 3 km = trench floor 9 km below sea level.

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Mid-ocean ridges: height is not water depth

Ridge relief

Mid-ocean ridges are underwater mountain systems formed where plates spread apart. Slow-spreading ridges commonly have a central rift valley. Some ridge peaks emerge above the sea. Iceland lies on the Mid-Atlantic Ridge, its example.

Iceland (emergent peak)

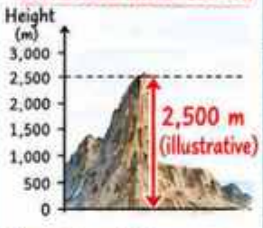


Iceland, part of the Mid-Atlantic Ridge

Water depth to the ridge top

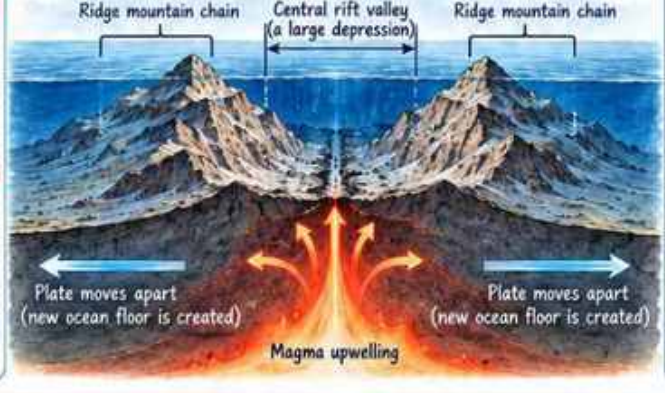
The global mid-ocean ridge system extends nearly 65,000 km, with more than 90% underwater. The average water depth to the ridge top is about 2,500 m.

Illustrative height above the local seabed

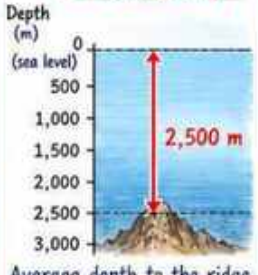


Illustrative relief: a summit 2,500 m above its local base. This example is not a universal ridge height.

Schematic cross-section of a mid-ocean ridge (not to scale)



Average water depth to the ridge top



Average depth to the ridge top is about 2,500 m below sea level.

Different meanings of the same number

Height is measured upward from the local seabed. Water depth is measured downward from sea level.

The illustrative 2,500 m height and the approximately 2,500 m average water depth use different reference levels; they need not describe one location.

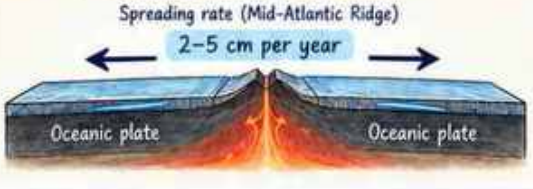
A global mid-ocean ridge system

The global ridge system is nearly 65,000 km long, with more than 90% underwater.



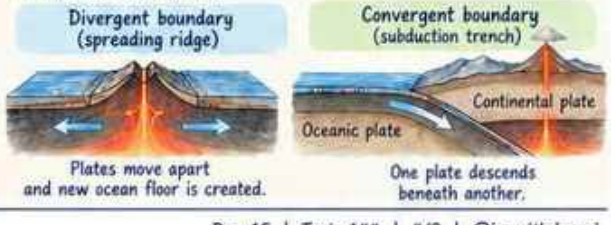
Formation at divergent boundaries

Ridges form at divergent boundaries: plates spread apart and new ocean floor is created. The Mid-Atlantic Ridge spreads slowly, about 2–5 cm per year. Its central rift valley is a deep depression between the ridge flanks.



Contrast the mechanisms

At a spreading ridge, plates move apart; at a subduction trench, one plate descends beneath another. These opposite boundary processes create different relief. Plate tectonics is revisited in Topic 286, Day 29.



Sources: S1, S4, S18.

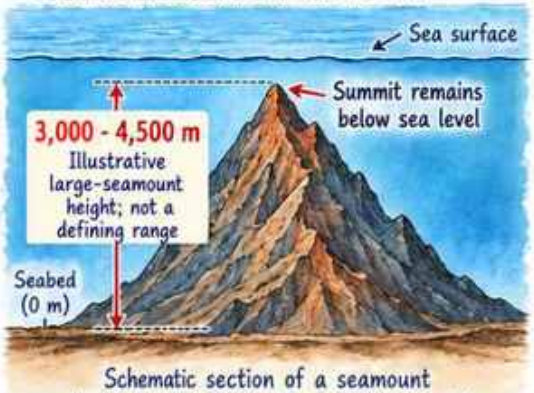
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Seamount, guyot and atoll

Seamount

A seamount is an underwater mountain rising from the seabed. Most are volcanic; shapes and heights vary. Large examples rise several thousand metres without reathing the surface.
The Hawaiian–Emperor chain contains islands and submerged volcanic mountains in the Pacific.



Schematic section of a seamount (volcanic mountain with pointed summit)

Guyot

A guyot is a flat-topped type of seamount. Seamount shapes vary.
A volcanic island can be flattened by wave erosion near sea level, then subside below the surface. Subsidence alone does not cut a summit flat.



Process of guyot formation (schematic section)

Seamounts occur throughout the oceans. Their estimated number depends on the minimum height counted and the coverage of seafloor mapping.

Counts depend on size threshold and mapping coverage

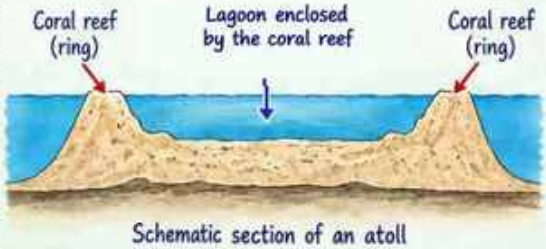


Atoll

An atoll is a ring-shaped coral reef surrounding a lagoon. Lagoon conditions vary with rainfall, evaporation and exchange with the open ocean.



Top view of an atoll (schematic)



Schematic section of an atoll

Read the forms by shape and process: pointed submerged mountain, flat-topped submerged mountain, and coral ring around central water. Atoll and guyot are different features.
Coral reefs and their types return in Topic 625, Day 63.

Sources: S1, S7, S8.

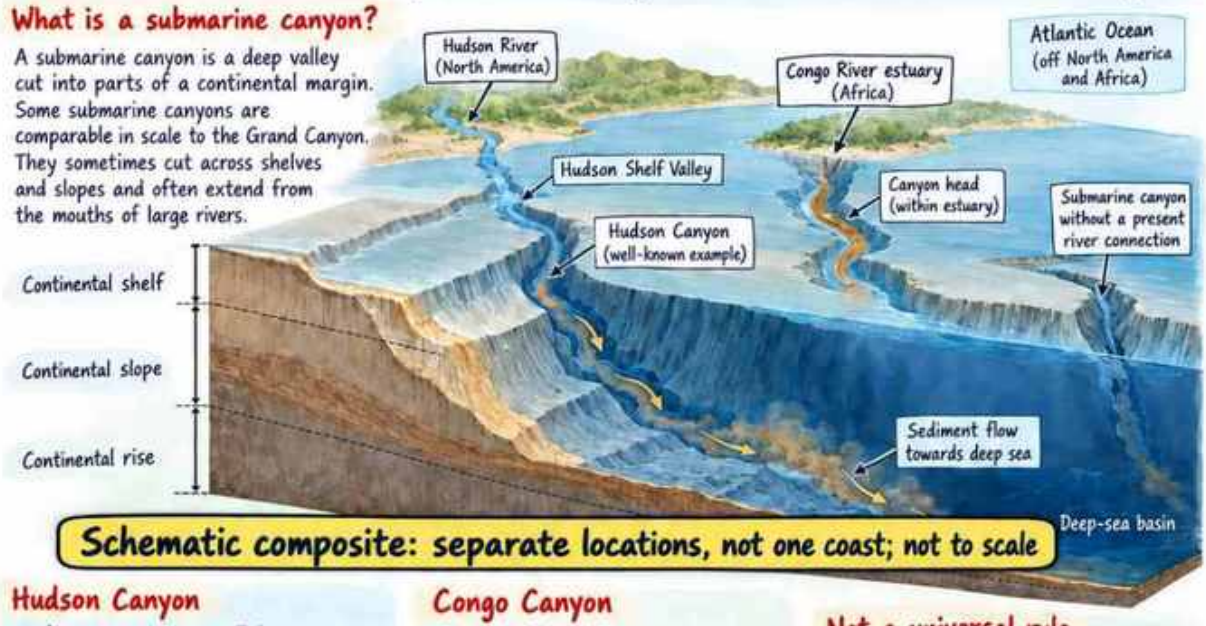
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Submarine canyons carry sediment downslope

What is a submarine canyon?

A submarine canyon is a deep valley cut into parts of a continental margin. Some submarine canyons are comparable in scale to the Grand Canyon. They sometimes cut across shelves and slopes and often extend from the mouths of large rivers.



Hudson Canyon

Hudson Canyon is a well-known example. It lies off the Atlantic coast of North America, seaward of the Hudson River, connected through the Hudson Shelf Valley. The canyon is connected to the river through the Hudson Shelf Valley; it is not simply the present river channel.

Congo Canyon

Congo Canyon lies off the Atlantic coast of Africa. Its head lies within the Congo River estuary. River-connected canyons can efficiently transfer sediment towards the deep sea.

Not a universal rule

Not every submarine canyon begins at a present-day river mouth. "Often" is important: the examples illustrate a connection, not a universal definition.

Role in sediment transfer

River-connected canyons can efficiently transfer sediment from continental shelves and slopes towards the deep sea.



Canyon vs trench

Submarine canyon



- Incised valley crossing parts of a continental margin.
- May act as a sediment pathway.
- Can cut across shelves and slopes.
- Often extend from the mouths of large rivers (but not always).

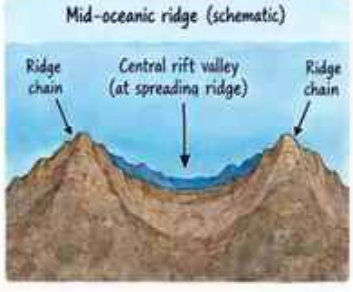
Subduction trench



- Long, narrow, exceptionally deep basin.
- Associated with particular tectonic settings.
- Different from a canyon.

Not a mid-oceanic ridge

A submarine canyon differs from a central rift valley at a spreading ridge.

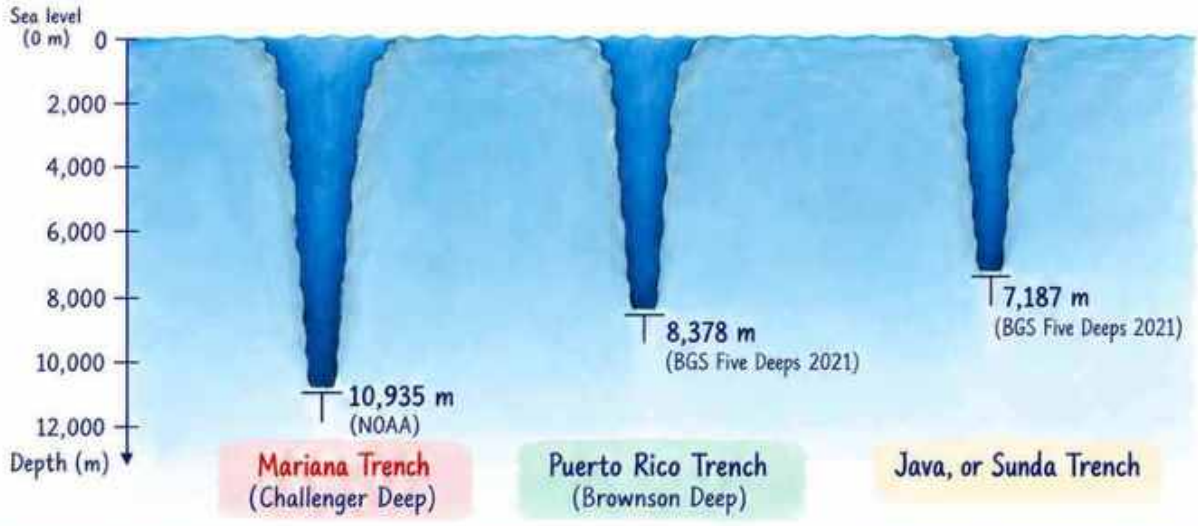


Sources: S1, S10, S11

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Named trenches: keep each survey beside its depth



Mariana Trench



Mariana Trench lies in the western Pacific, near the Mariana Islands and east of Guam. Challenger Deep, near its southern end, is the deepest known ocean point. The trench is an elongated landform; the deep is a specific place within it. One current reference estimate is approximately 10,935 m (35,876 feet); survey estimates differ.

Puerto Rico Trench



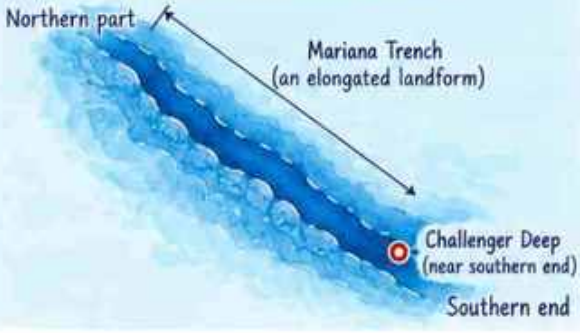
Puerto Rico Trench lies in the North Atlantic, north of Puerto Rico. Brownson Deep was measured at approximately 8,378 m in the Five Deeps survey published in 2021, identifying the Atlantic's deepest surveyed point in that dataset.

Java, or Sunda Trench



Java, or Sunda Trench lies in the eastern Indian Ocean, off Sumatra and Java. The Five Deeps survey measured the Indian Ocean's deepest point here at approximately 7,187 m; the descent took place in 2019 and the survey was published in 2021.

Schematic plan view of Mariana Trench (not to scale)



Survey note: different estimates

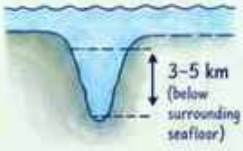
Depth estimates depend on survey and method. The 2021 Five Deeps estimate for Challenger Deep is approximately 10,924 m; another reference estimate is approximately 10,935 m. These are separate measurements, not the limits of a single official range.

BGS (2021, Challenger): 10,924 m

Alternative reference estimate: 10,935 m

Relative relief versus sea-level depth

An illustrative 3–5 km trench relief is measured below the surrounding seafloor. It is not the sea-level depth of any named trench.



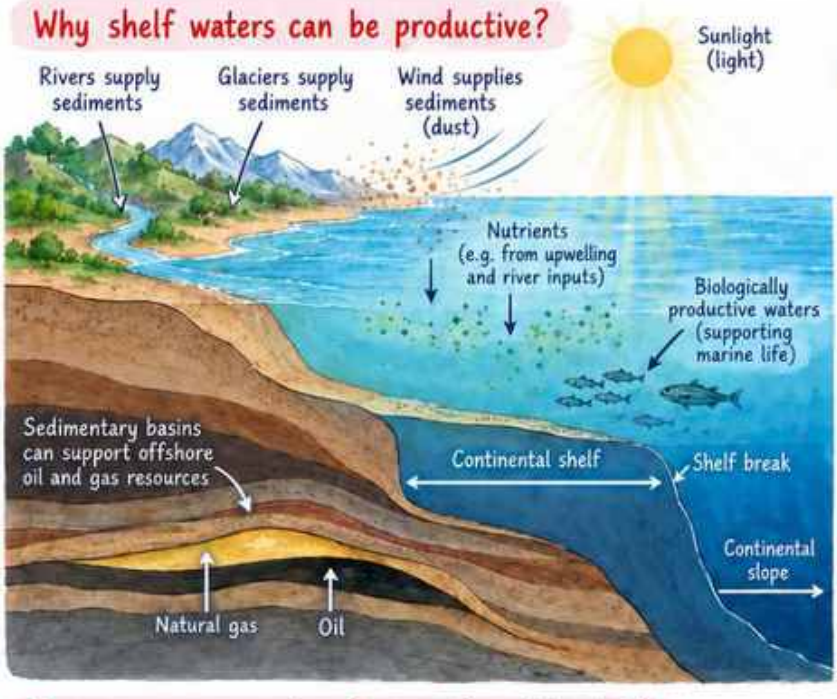
Sources: S1, S3, S5.

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India's shelf: resources, examples and limits

Why shelf waters can be productive?



Example: Mumbai High

Mumbai High is an important offshore oil and gas field in the Arabian Sea, near Mumbai, operated by ONGC.



1974 Discovered in 1974.

1976 Production beginning in 1976.

These dates provide a clear Indian example of offshore hydrocarbon development.

Two measurements of a continental shelf

Shelf width: horizontal distance

Shelf width is the horizontal distance from the coast to the shelf break. It varies along a continental margin; one coastal section cannot represent every coast.

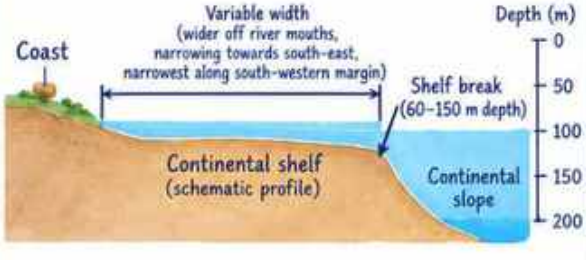


Width and depth are different measurements. Both profiles are schematic and do not share a comparative width scale.

Shelf-break depth: vertical measurement

Western Indian margin

Along the western Indian margin, the shelf is wider off river mouths, narrows towards the south-east, and is narrowest along the south-western margin. Shelf-break depths vary roughly from 60 to 150 m.



Shelf waters can support fisheries, and sedimentary basins may contain hydrocarbons. Resource occurrence varies with geology and ocean conditions.

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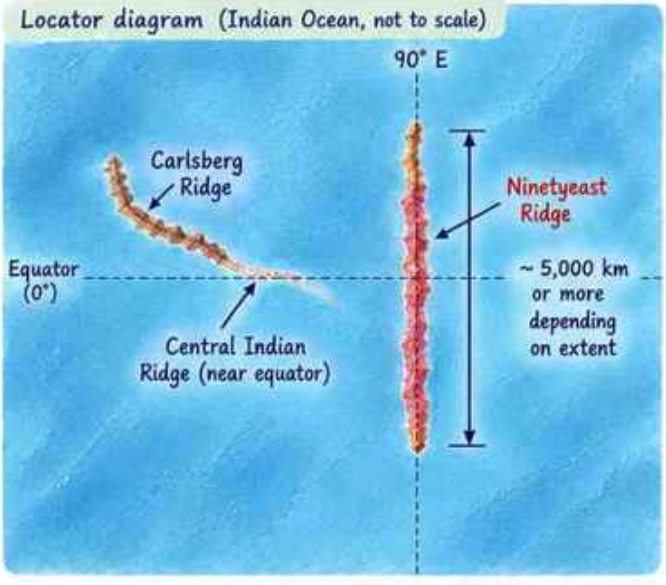
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Indian Ocean ridges: hotspot trail versus spreading boundary

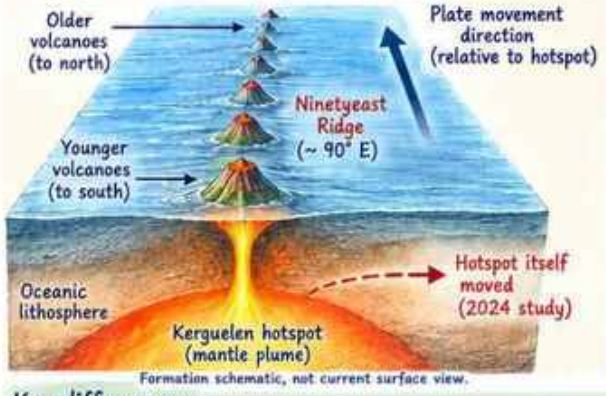
Key points

- Ninetyeast Ridge is a long volcanic ridge roughly along 90° E in the Indian Ocean. Its measured length depends on which extensions are counted; modern studies describe roughly 5,000 km or more, including buried parts.
- It records Kerguelen-hotspot volcanism and plate movement. A 2024 study shows that the hotspot itself moved. The older label "aseismic ridge" distinguishes its origin from an active spreading ridge; it does not mean earthquakes never occur. Deformation and earthquakes occur on and around Ninetyeast Ridge.
- Carlsberg Ridge is an active, slow-spreading mid-ocean ridge in the north-western Indian Ocean and Arabian Sea region. It forms a divergent boundary between the Indian and Somali plates and joins the Central Indian Ridge system near the equator. Seismic and volcanic activity accompany spreading.
- Compare the mechanisms: Ninetyeast Ridge is a hotspor-built volcanic trail; Carlsberg Ridge is an active plate-spreading boundary between the Indian and Somali plates. They represent different formation mechanisms.
- The Andaman Sea is a marginal sea in the north-eastern Indian Ocean. The Andaman and Nicobar islands are emergent parts of submarine mountain systems. Topic 136 supplies the wider coastal and island context.

Locator diagram (Indian Ocean, not to scale)

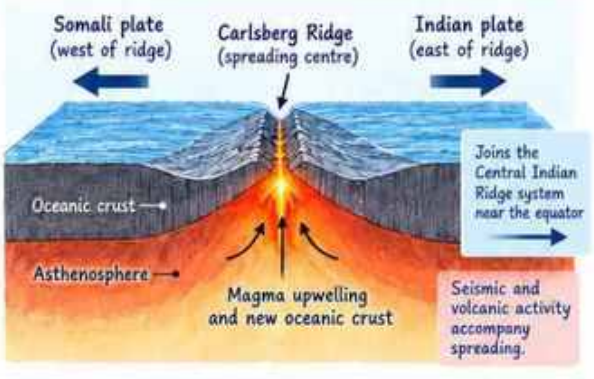


Ninetyeast Ridge – hotspot-built volcanic trail



Formation schematic, not current surface view.

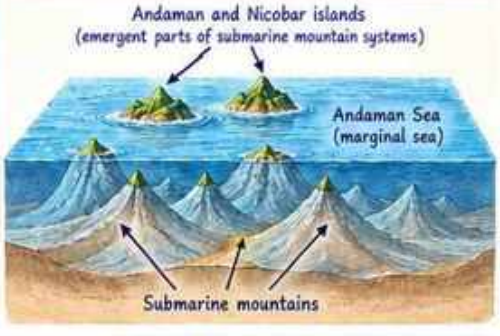
Carlsberg Ridge – active, slow-spreading mid-ocean ridge



Key differences

Aspect	Ninetyeast Ridge	Carlsberg Ridge
Origin	Hotspot-built volcanic trail (Kerguelen hotspot)	Active mid-ocean ridge (spreading boundary)
Tectonic setting	Intraplate (hotspot track)	Divergent boundary between Indian and Somali plates
Volcanic activity	Records past hotspot volcanism	Active volcanism with spreading
Seismicity	Deformation and earthquakes occur on and around the ridge ("aseismic ridge" does not mean no earthquakes)	Seismic and volcanic activity accompany spreading
Plate motion link	Records plate movement and a 2024 study shows the hotspot itself moved	Formed by seafloor spreading; joins the Central Indian Ridge near the equator
General character	Long volcanic ridge (~ 5,000 km or more)	Active, slow-spreading mid-ocean ridge

Andaman Sea – emergent parts of submarine mountain systems



Sources: S2, S14, S15, S16, S17, S18, S19.

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Census 2011: Understanding Provisional and Final Figures

Distribution tells us where people live; density measures people per unit area; growth measures change over time. ORGI, under the Ministry of Home Affairs, conducts the Census. The 2011 national count refers to 1 March 2011.

	FINAL CENSUS FIGURES	PROVISIONAL CENSUS FIGURES
Population	1,210,854,977  Schematic people icons, not to scale	1,210,193,422  Schematic people icons, not to scale
2001–11 growth	17.7%	17.64%
Density	382 persons/km²	382 persons/km²
Sex ratio	943	940 females per 1,000 males
Literacy	73.0% final	74.04% provisional

Final total = 121.09 crore = 1,210.85 million; Approximately 1,210 million.

Urban and rural shares: 2011 release status



Urban 31.16% (provisional)



Rural about 68.8% (provisional, rounded)

Final urban share: 31.14%.

India's share in the world (2011 context)



17.5% of world population

2.4% of world area

These are historical comparisons, not 2026 population shares.

Provisional totals are assembled soon after enumeration. Validation and processing can revise the totals and derived indicators.

Compare figures for the same reference year and territorial boundaries. State whether each figure is provisional or final.

YEAR + BOUNDARY + RELEASE STATUS

Sources: S1, S2, S3, S4, S10

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Population Size and Density Give Different Rankings

All figures below refer to Census 2011 boundaries.

TOTAL POPULATION

State with the most people



The next three are Maharashtra, Bihar and West Bengal.

STATE DENSITY

Densest State



ALL STATE/UT DENSITY

Densest State or Union Territory



Fewest People Among States

Sikkim, 610,577.

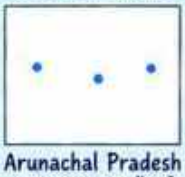
Its density is 86 persons/km²; the smallest population does not mean the lowest density.



Least Dense State

Arunachal Pradesh, 17 persons/km².

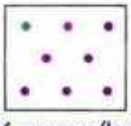
Its 2011 population was about 0.11% of India's total.



Other Final Figures

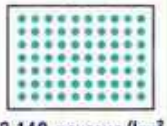
Andaman and Nicobar Islands

Density 46 persons/km².



Lakshadweep

Population 64,473 and density 2,149.



2011 provisional density examples

West Bengal 1,029; Uttar Pradesh 828; Kerala 859.

These illustrate dense northern settlement and Kerala's dense peninsular settlement.



All dot diagrams are schematic; dot counts are not proportional to Census densities.

Which State has the most people?	Which State is densest?	Which State/UT is densest?
Uttar Pradesh	Bihar	Delhi

Sources: S1, S2, S3, S4

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Undivided Andhra Pradesh and Uneven Settlement

Census 2011

Census 2011 preceded Andhra Pradesh's division in 2014. The historical State row is for UNDIVIDED ANDHRA PRADESH:

Population	84,580,777, about 7% of India
Density	308 persons/km²
Sex ratio	993 females per 1,000 males
2001–11 decadal growth	11.0%

2014
Andhra Pradesh's division

CHECK TERRITORIAL BASE

Do not transfer these figures to present-day Andhra Pradesh without checking the territorial base.

Present-day Andhra Pradesh

Present-State figures may differ because the territorial base has changed due to the 2014 division.

Using the provisional 2001–11 growth figures, the decline from 1991–2001 among the six most populous States was smallest in undivided Andhra Pradesh, about 3.5 percentage points, and largest in Maharashtra, about 6.7 points.

Why is population unevenly distributed?

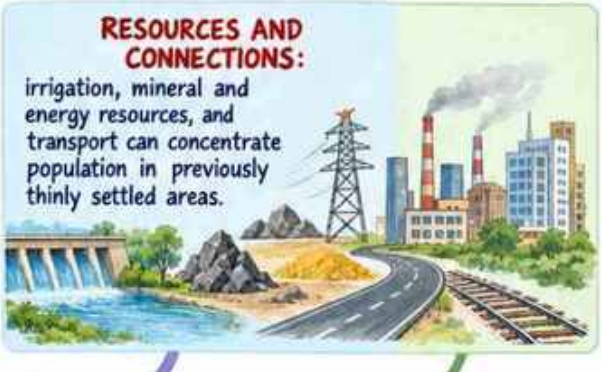
PHYSICAL:
climate, terrain and water availability.



HISTORICAL AND SOCIO-ECONOMIC:
- settled agriculture and agricultural development;
- settlement patterns;
- transport networks;
- industrialisation and urbanisation.



RESOURCES AND CONNECTIONS:
irrigation, mineral and energy resources, and transport can concentrate population in previously thinly settled areas.





These factors work together; a density figure alone does not identify one cause.

Revision links: Andhra Pradesh Reorganisation Act and population ratio, Topic 14; present-State figures, Topic 275.

Sources: S1, S3, S4

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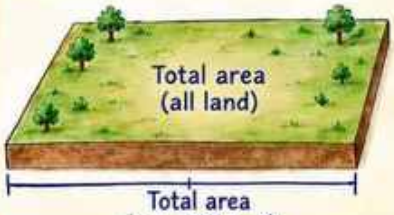
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Three Density Measures: Read the Denominator

ARITHMETIC POPULATION DENSITY

Total population ÷ total area.

India's Census 2011 figure is 382 persons per square kilometre. Earlier figures were 325 in 2001 and 117 in 1951.

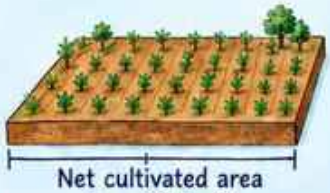


Total area
(e.g., 100 km²)

PHYSIOLOGICAL DENSITY

Total population ÷ net cultivated area.

This compares all people with land actually cultivated.

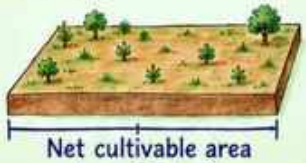


Net cultivated area
(e.g., 20 km²)

AGRICULTURAL DENSITY

Total agricultural population ÷ net cultivable area.

Net cultivated area and net cultivable area are different measures; the denominator changes what the ratio describes.



Net cultivable area
(e.g., 25 km²)

The two farmland-based measures must not be substituted for ordinary density. Their numerators also differ: all people versus agricultural people.

Illustrative calculation only, not an Indian Census dataset:

Total population 1,000; total area 100 km²; net cultivated area 20 km²; agricultural population 100; net cultivable area 25 km².

HYPOTHETICAL

ARITHMETIC POPULATION DENSITY	Total population 1,000 / Total area 100 km²	1,000 ÷ 100 =	10 persons/km²
PHYSIOLOGICAL DENSITY	Total population 1,000 / Net cultivated area 20 km²	1,000 ÷ 20 =	50 persons/km² of cultivated area
AGRICULTURAL DENSITY	Total agricultural population 100 / Net cultivable area 25 km²	100 ÷ 25 =	4 agricultural persons/km² of cultivable area

First identify the numerator and denominator; only then calculate or compare.

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Four Phases and the Decadal Growth Curve

FOUR BROAD HISTORICAL PHASES

I: 1901–1921
stagnant or stationary.
Growth was very low; 1911–21 was negative.



II: 1921–1951
steady growth.
Better health, sanitation, transport and communication supported growth.



III: 1951–1981
population explosion.
Mortality fell rapidly while fertility stayed high; average annual growth was about 2.2%.

Mortality fell rapidly + Fertility stayed high → Population explosion

IV: after 1981
High but slowing growth.
A falling crude birth rate helps explain slower growth.



HISTORICAL DECADAL GROWTH, %



1. Decade ending 1921: −0.31
1951: 13.31; 1961: 21.51; 1971: 24.80
1981: 24.66; 1991: 23.85; 2001: 21.54;
2011: 17.64 (provisional).

2. 1921 is the turning point in the 1901–2011 series: 1911–21 is its only negative decade. Every later decade through 2001–11 is positive.

3. The table's peak, 24.80%, belongs to 1961–71, not to the decade after 1971.

4. Population rose by over 181 million during 2001–11; average annual growth was 1.64%. Decadal growth fell about 4 percentage points from 21.54% in 1991–2001.

5. The 2011 endpoint shown is provisional. Historical growth series can differ with revisions and territorial adjustments.

Sources: S1, S2, S5

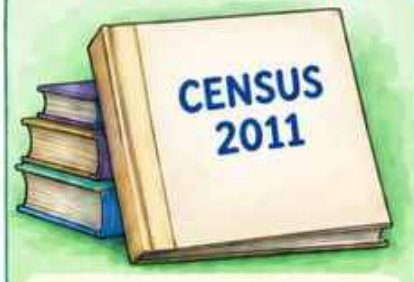
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Census Counts and UN Projections: Different Clocks

A Census count and a United Nations estimate or projection are different kinds of evidence. Keep the reference year and publication date beside each number.

2011 POPULATION CONTEXT



In 2011, India had the world's second-largest population, after China. This ranking describes that historical year.

24 APRIL 2023 UN ANNOUNCEMENT

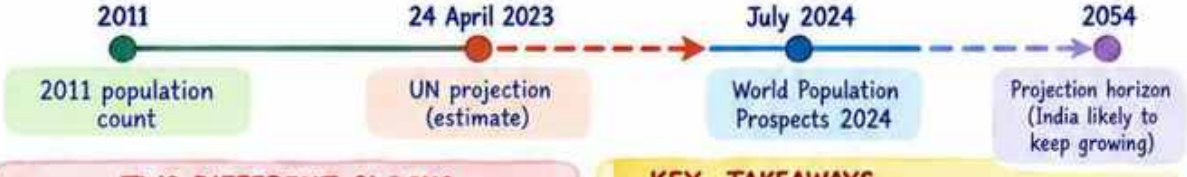


UN DESA projected India to reach 1,425,775,850 people by the end of April 2023 and surpass China as the world's most populous country. This is an estimate/projection, not a new Indian Census count.

WORLD POPULATION PROSPECTS 2024



UN DESA's Population Division prepares WPP. The July 2024 edition places world population at 8.2 billion in 2024 and India among countries whose population is likely to keep growing through 2054.



TWO DIFFERENT CLOCKS



REFERENCE YEAR

Year to which the population number actually refers.



PUBLICATION DATE

Date when the number is released, such as a census report, estimate or projection.

KEY TAKEAWAYS

- Do not present the 2011 ranking as the current ranking or relabel a projection as enumeration.
- Further study: world trends, Topic 386.
- Composition, age, sex, literacy, religion, language, child sex ratio, migration and urbanisation are covered in Topics 215, 244, 316, 325, 425 and 475.



Sources: S1, S8, S9

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Census 2027: Three Reference Dates

30 April 2025



Cabinet Committee on Political Affairs decided to include caste enumeration.

16 June 2025



Census 2027 notified in the Gazette.

12 December 2025



Cabinet approved the scheme, costing ₹11,718.24 crore.

5 September 2026



replacement notification revised the reference-date framework.

Census 2027 is India's 16th Census and the 8th since independence.

A **reference date** is the moment to which the count refers; it is not the whole fieldwork period.

LANE 1
MOST OF INDIA



Population Enumeration scheduled for **February 2027.**

Reference: 00:00 hours, 1 March 2027.

ENUMERATION — February 2027 — 1 March 2027

LANE 2
LADAKH + SNOW-BOUND AREAS



Ladakh, and snow-bound areas of Jammu and Kashmir, Himachal Pradesh and Uttarakhand: enumeration scheduled in **September 2026.**

Reference: 00:00 hours, 1 October 2026.

ENUMERATION — September 2026 — 1 October 2026

LANE 3
FOUR EARLIER-ENUMERATION AREAS



Goa, Uttar Pradesh, Punjab and non-snow-bound Uttarakhand: enumeration **1 December 2026–4 January 2027**; revision **5–9 January 2027.**

Reference: 00:00 hours, 5 January 2027.

ENUMERATION — 1 December 2026 – 4 January 2027

REVISION — 5 – 9 January 2027 — 9 January 2027

Do not extend the October exception to all Jammu and Kashmir.

Do not give 1 March as the reference for every area.

Schedules are plans; elapsed dates do not independently prove that fieldwork was completed.

Cutoff: 17 October 2026.

Sources: S6, S7, S11, S12, S13

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First Digital Census: Workflow and Schedule Exceptions

PHASE 1: HOUSELISTING AND HOUSING CENSUS

- The original national window was April – September 2026, with a notified 30-day period for each State or Union territory.
- This is a scheduling statement, not evidence of universal completion.

April – September 2026

Apr 2026	May 2026	Jun 2026	Jul 2026	Aug 2026	Sep 2026

Notified 30-day period for each State or Union territory.

LATER EXCEPTIONS

5 September 2026



Houselisting and Housing Census in Manipur was deferred until further declaration.

17 September 2026



Houselisting in Charaideo and Sivasagar districts of Assam received a district-specific extension.

A fieldwork extension changes the operating window. It does not establish completion of houselisting or population enumeration.

PHASE 2: POPULATION ENUMERATION

- Caste data are to be captured electronically during this phase.

Houselisting and Housing Census (Phase 1)



Homes / building checklist

Population Enumeration (Phase 2)



Data collected through mobile apps on Android and iOS.

Self-enumeration (by citizens)



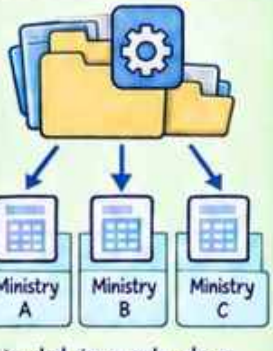
Citizens have the option of self-enumeration.

Supervised Data Pipeline



About 30 lakh field functionaries are involved: enumerators, supervisors, master trainers, charge officers and district census officers.

Census-as-a-service (CaaS)



Intended to supply clean, machine-readable data to ministries.

Keep four ideas separate: houselisting, population enumeration, the reference moment and a completion announcement. A digital method changes collection and data delivery; it does not remove the need for an officially notified schedule.

Schedule context: September 2026 notifications.

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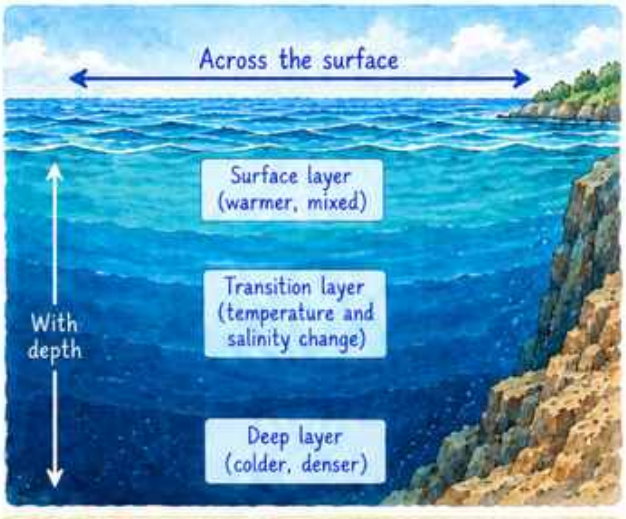
Ocean water: heat, salt and density

Temperature tells us how hot or cold seawater is. Salinity tells us how much dissolved salt it contains. These are different properties: warm water is not automatically saltier.

Follow two balances

- Heat gained and lost changes temperature.
- Freshwater gained and lost changes salt concentration.





Why they matter

Temperature and salinity help determine density: mass per unit volume. Density differences affect layering and ocean circulation; pressure also affects density.

Two directions to study

- Across the surface: compare latitudes, coasts and ocean basins.
- Down the water column: compare surface, transition and deep layers.

Think it through

Heating a covered seawater sample does not add salt. Evaporating some of its water leaves the remaining sample saltier.

Temperature changes



Heating changes temperature but does not add salt.

Salinity rises



Evaporating some of the water leaves the remaining sample saltier.

From properties to ocean behaviour



Source reference: NOAA | Concept-first teaching edition

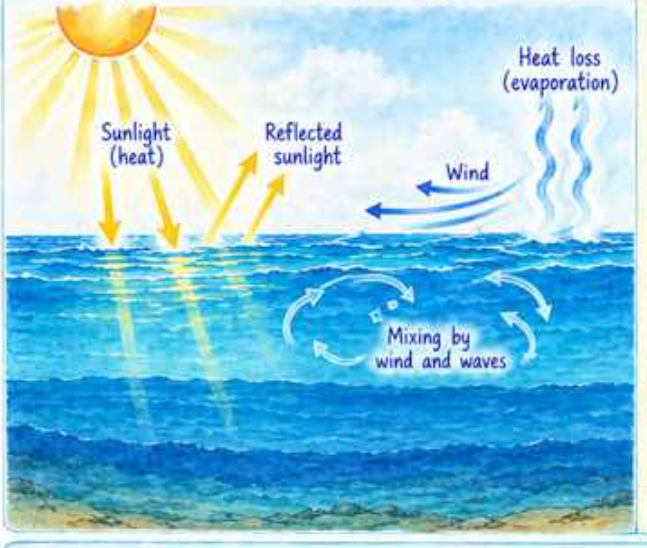
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Why does the ocean warm slowly?

Sunlight supplies most of the heat to the upper ocean. Some energy is reflected, while absorbed energy warms the water.



Three reasons for a slow response

1. **High heat capacity**



Water needs much energy for a small temperature rise.

2. **Mixing**



Wind and waves spread heat through a layer, rather than heating only a thin surface.

3. **Evaporation**



Escaping water carries heat away from the surface.

The heat budget

Temperature rises when heat gain exceeds heat loss. It falls when heat loss exceeds heat gain.

Gain greater than loss: warming



Loss greater than gain: cooling

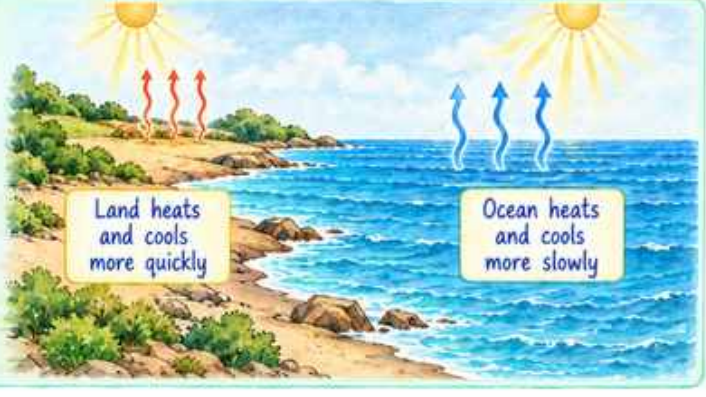


The ocean exchanges heat with the atmosphere through radiation, evaporation and direct contact. Currents also carry heat from one region to another.

Application

Coastal climates are often moderated because the nearby ocean stores heat and releases it gradually.

Ocean water generally heats and cools more slowly than land.



References: Day 16 Source Index | Topic 156

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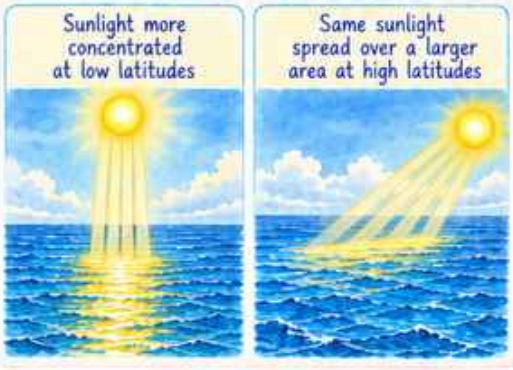
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Why surface temperatures differ

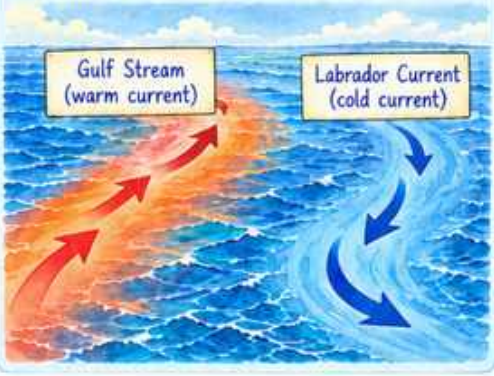
1. Latitude sets the broad pattern

Low latitudes receive more concentrated sunlight over the year. Poleward, the same incoming rays spread over a larger area, so the ocean surface is generally cooler.



2. Currents modify the pattern

Warm currents carry heat towards cooler regions. Cold currents bring cooler water into warmer regions. The Gulf Stream is a warm current; the Labrador Current is cold.



3. Winds and mixing matter

Winds move surface water and mix it with water below. Upwelling can bring colder water to the surface, cooling a coast even at low latitude.



4. Land and basin shape matter

Land heats and cools faster than water. Nearby land, seasonal winds and restricted exchange can change the temperature of a marginal sea.



5. Read the pattern, not a fixed formula

Surface temperature also varies with season, clouds and circulation. It does not fall by one identical amount at every degree of latitude.



References: Day 16 Source Index | Topic 156

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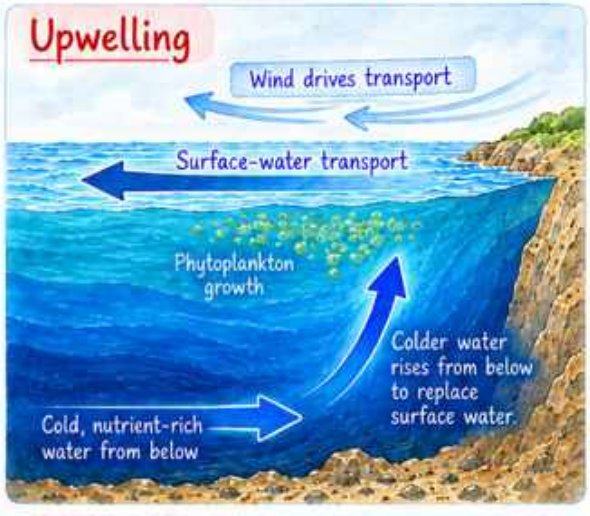
How winds bring cold water upward

Upwelling is the rise of deeper water to replace surface water that has moved away.

Read the mechanism

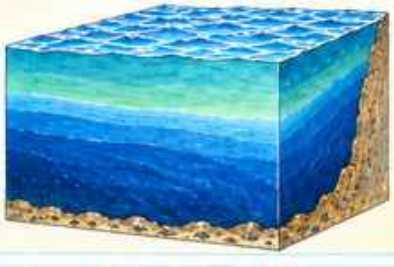
1. Wind drives surface-water transport.
2. When that transport moves water away from a coast, a gap develops near the surface.
3. Colder water rises from below to replace it.

Upwelling



Why the coast becomes cooler

The replacement water has been below the strongly sun-heated surface. It is usually colder and often nutrient-rich.

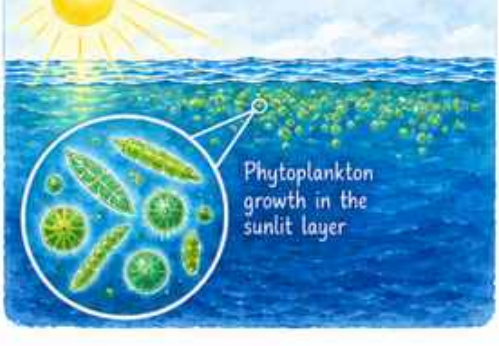


Downwelling



The biological link

Nutrients reaching the sunlit layer support phytoplankton growth and can sustain productive fishing grounds.



Important distinction

Wind direction and water-transport direction are not always the same. Earth's rotation helps determine the transport; alongshore winds can cause coastal upwelling.



Source reference: NOAA | Concept-first teaching edition

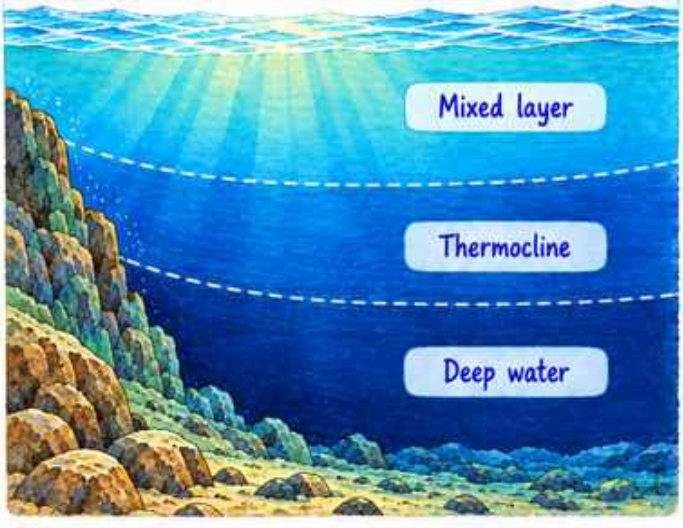
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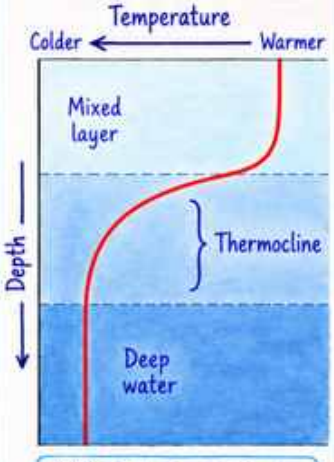
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Temperature with depth: three zones

A common low-latitude profile



Typical temperature profile



Not to scale; boundaries vary.

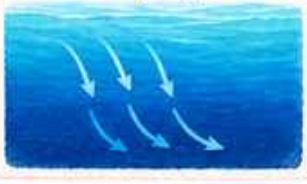
1. Mixed layer

Sunlight warms the upper ocean. Wind and waves mix this water, so temperature changes relatively little within the layer.



2. Thermocline

Below the mixed layer, temperature falls rapidly with increasing depth. This is a transition zone, not the deep layer itself.



3. Deep water

Below the main thermocline, the water is cold and temperature usually changes much more slowly with depth.



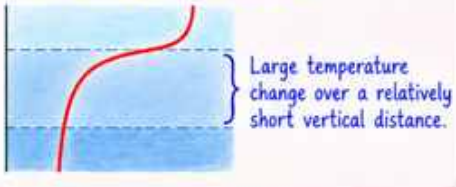
Why the contrast develops

Sunlight is absorbed mainly in the upper ocean. A warm, less-dense surface layer resists mixing with colder, denser water below.



Read a temperature profile

Moving downward through the thermocline means a large temperature change over a relatively short vertical distance.



Remember

Layer depths vary by place and season. This is a schematic pattern, not three fixed-depth compartments for every ocean.

Source reference: NOAA | Concept-first teaching edition

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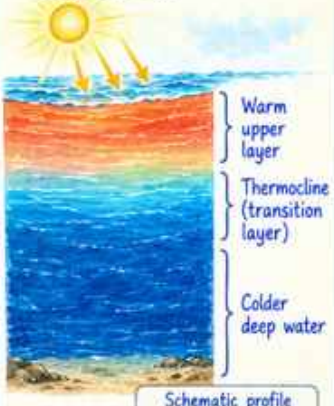
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Layers change with latitude and season

Tropics

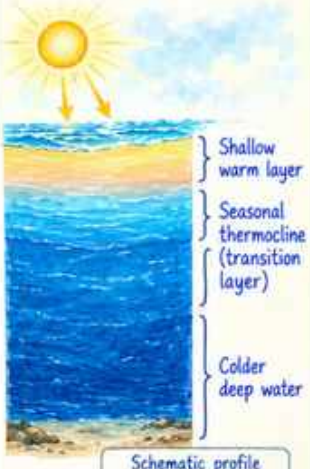
- Strong year-round surface heating commonly maintains a warm upper layer above colder deep water, with a persistent thermocline between them.



Schematic profile (not to scale)

Temperate seas – summer

- Summer heating creates a shallow warm layer and a seasonal thermocline.



Schematic profile (not to scale)

Temperate seas – winter

- Winter cooling and stronger mixing can weaken this seasonal contrast and deepen the mixed layer.



Schematic profile (not to scale)

Polar seas

- A warm-surface thermocline may be weak or absent.
- But cold water does not mean that the entire water column is uniform.



An Arctic example (not all polar oceans)

- Relatively fresh, near-freezing surface water can lie above saltier water and a warmer Atlantic-origin layer.
- A strong salinity gradient can limit vertical mixing.



Schematic profile (not to scale)

The key idea

- Temperature layering and salinity layering are related but different. A weak thermocline does not prove that there is no stratification.

Temperature layering
Controls density through temperature differences.



Salinity layering
Controls density through salinity differences.



Always ask

- Which region, which season and which property does this profile describe?



Source reference: NOAA | Concept-first teaching edition

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Salinity: salt in a seawater sample

1. What is salinity?

Salinity is the concentration of dissolved salts in water.



Sodium and chloride are the dominant ions. Seawater contains many salts, not only sodium chloride.

2. Understand 35 parts per thousand

A 1,000 g sample of seawater at about 35 ‰ contains about 35 g of dissolved salts and 965 g of water. This is about 3.5% by mass.



965 g water + 35 g dissolved salts = 1,000 g seawater (about 3.5% by mass)

3. The denominator matters

It is 35 g of salt in 1,000 g of seawater, not 35 g added to 1,000 g of pure water.

35 g in 1,000 g of seawater



35 g added to 1,000 g of pure water



4. A useful scale

Average ocean salinity is about 35 ‰. Much open-ocean water lies around 33–37 ‰, but coastal waters and restricted seas can differ greatly.



5. Where do the salts come from?

Weathering releases ions from rocks on land; rivers carry them to the sea. Seafloor reactions and volcanic sources also contribute dissolved substances.



6. What is dissolved?

Sodium and chloride are the dominant ions. Seawater contains many salts, not only sodium chloride.



Source reference: NOAA | Concept-first teaching edition

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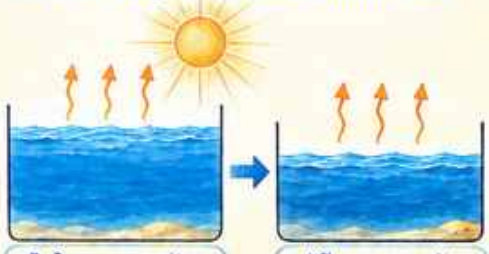
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What makes seawater saltier or fresher?

Follow the water, then the salt.

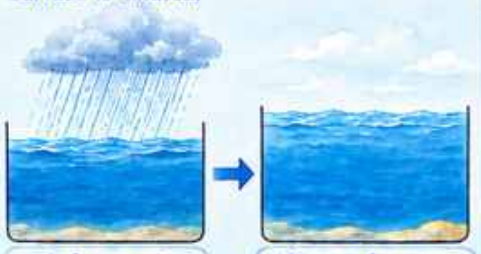
Evaporation → salinity rises

Water leaves as vapour; most dissolved salts remain. Less water holds nearly the same salt, so its concentration rises.



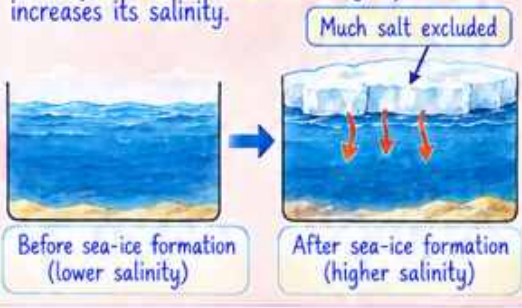
Rain and rivers → salinity falls

Freshwater is added. The existing salts are spread through more water, so the surface is diluted.



Sea-ice formation → remaining water becomes saltier

Growing sea ice excludes much of the salt. Salt rejected into the surrounding liquid water increases its salinity.



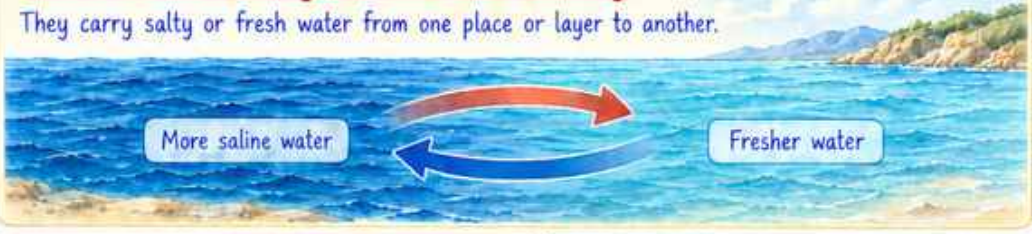
Ice melting → surface water becomes fresher

Meltwater adds freshwater and dilutes seawater.



Currents and mixing redistribute salinity

They carry salty or fresh water from one place or layer to another.



Memory rule

Remove freshwater: concentrate the salts.
Add freshwater: dilute the salts.

Qualification

These processes can act together; the observed salinity reflects their combined balance and water movement.

References: Day 16 Source Index | Topic 156

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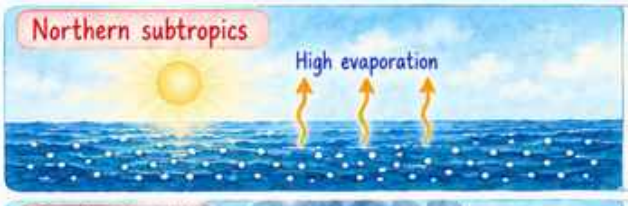
Why the saltiest belt is not the equator

The surface pattern follows the freshwater balance, not temperature alone.



Higher latitudes: often fresher surfaces

Lower evaporation, precipitation and seasonal ice melt can reduce salinity. Sea-ice formation locally raises the salinity of the remaining liquid water.



Subtropical belts: evaporation wins

Around 20°–30° north and south, descending dry air often brings little rain. Strong evaporation with limited freshwater input favours high surface salinity.



Equatorial belt: warm but rainy

Strong heating encourages evaporation, but frequent heavy rain supplies much freshwater. Dilution keeps surface salinity lower than in the dry subtropics.



Subtropical belts: evaporation wins

Around 20°–30° north and south, descending dry air often brings little rain. Strong evaporation with limited freshwater input favours high surface salinity.



Higher latitudes: often fresher surfaces

Lower evaporation, precipitation and seasonal ice melt can reduce salinity. Sea-ice formation locally raises the salinity of the remaining liquid water.

Surface salinity depends on the balance



Surface salinity is higher where evaporation exceeds the supply of freshwater from rainfall, river runoff and ice melt, and lower where freshwater input is large enough to dilute the surface water.

Local conditions modify every belt



Rivers, currents, sea-ice changes and enclosed basins can interrupt the broad latitudinal pattern.

Exam reasoning

"Hottest water must be saltiest" is false. Compare evaporation with rainfall, runoff and ice processes before predicting salinity.

Source reference: NOAA | Concept-first teaching edition

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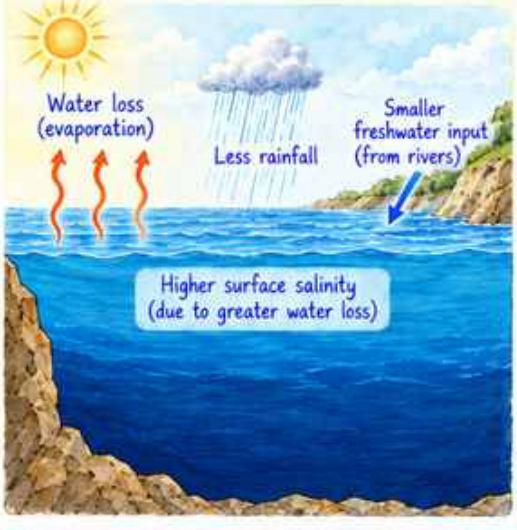
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Arabian Sea and Bay of Bengal: explain it

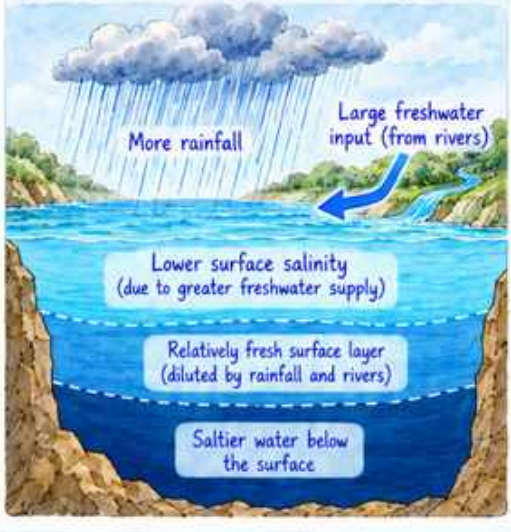
Arabian Sea

Evaporation removes a large amount of water. Freshwater input is smaller relative to this loss, so dissolved salts become more concentrated.



Bay of Bengal

Heavy rainfall and major rivers add large amounts of freshwater. This dilutes the surface and forms a relatively fresh upper layer.



Trace the cause and effect





Why the fresh layer matters

Fresher water is less dense than saltier water at the same temperature and pressure. It can help maintain stable layering and reduce mixing with water below.



Below the surface

Saltier water can occur beneath the Bay's fresh surface layer; the surface comparison does not describe every depth.



Qualification

Monsoons, river discharge and circulation change the pattern through the year.

Source reference: Oceanography | Concept-first teaching edition

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Why nearby seas can have different salinity

Think of a sea as a water-and-salt budget.

Dry climate + evaporation

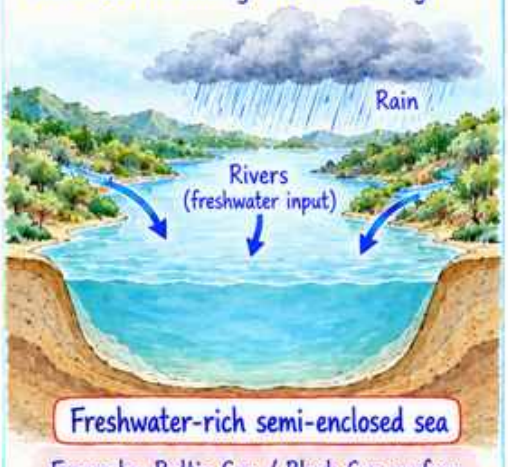
The Red Sea and Mediterranean Sea lose much water by evaporation. Limited freshwater supply helps make them saltier than many open-ocean waters.



Example: Red Sea / Mediterranean

Wet drainage basin + river inflow

Large freshwater inputs help keep the Baltic Sea and the surface of the Black Sea relatively low in salinity.



Example: Baltic Sea / Black Sea surface

Restricted exchange amplifies local effects

A narrow connection limits how quickly a sea exchanges water with the open ocean. It does not automatically make the sea salty: the freshwater balance still matters.



Connected is not landlocked

The Red Sea exchanges water with the Gulf of Aden through Bab el-Mandeb. Its high salinity does not mean that it has no outlet.



Application

Two semi-enclosed seas can have opposite salinity patterns if one loses freshwater overall and the other receives it.



References: Day 16 Source Index | Topic 156

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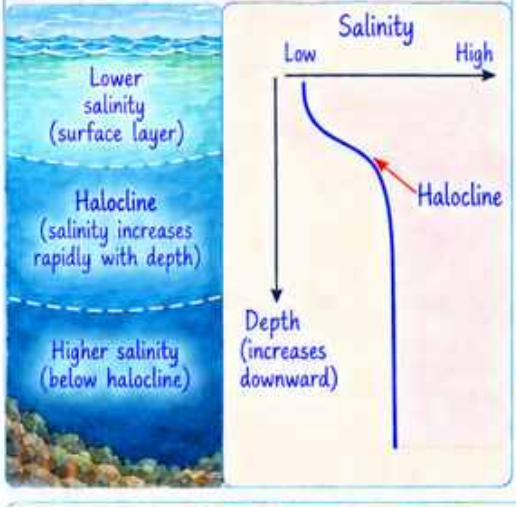
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Halocline: a sharp salinity change with depth

A halocline is a layer where salinity changes rapidly with depth. The change can be upward or downward in value as you descend.

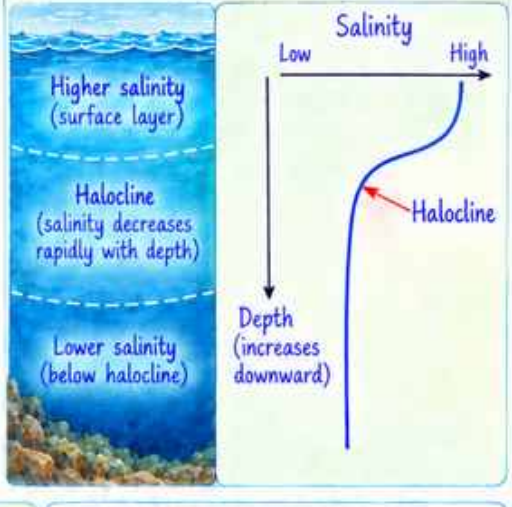
Case A: a fresh surface layer

Rain, river water or ice melt can freshen the top. Salinity then increases sharply below this cap.



Case B: a salty surface layer

Strong evaporation can leave the surface saltier than the water beneath. Salinity may decrease sharply with depth through the transition.



Do not confuse the variables

Thermocline
Rapid temperature change with depth.

Halocline
Rapid salinity change with depth.

Pycnocline
Rapid density change with depth.



A salinity profile alone is not a density profile

Both temperature and salinity affect density. A warm, salty surface layer can remain above colder water if the combined density structure is stable.



Read the axes first

Depth increases downward; salinity increases towards the right.
These are schematic examples, not universal ocean profiles.

Source reference: NOAA | Concept-first teaching edition

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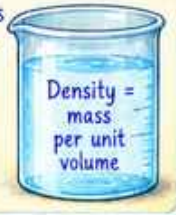
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Density connects heat, salt and circulation

Density means mass per unit volume

Density tells us how much mass is contained in a given volume of water.



Change one factor at a time

Same salinity and pressure (cooling and warming)



At the same salinity and pressure, cooling ordinary seawater usually makes it denser; warming makes it less dense.

Same temperature and pressure (adding or removing salt)



At the same temperature and pressure, adding dissolved salt increases density; adding freshwater lowers it.

Stable layering

Lighter water lies above denser water. This arrangement resists overturning, although winds and tides can still mix water.



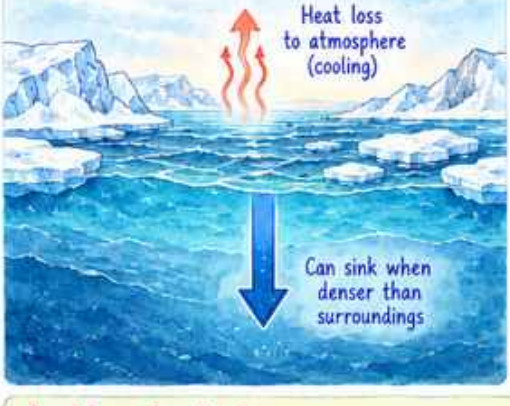
Two factors can increase density

Cooling	Increasing salinity
Lower temperature increases density (at the same salinity and pressure).	More dissolved salt increases density (at the same temperature and pressure).

Both factors make water denser.

How sinking begins

Surface water that becomes sufficiently dense through cooling and salinity changes can sink beneath surrounding water. This helps form deep water in some high-latitude regions.



Thermohaline circulation

"Thermo" refers to temperature; "haline" refers to salinity. Density differences contribute to deep-ocean circulation. Winds and mixing also help drive the overall circulation.

Avoid a shortcut



"Saltier always sinks" is incomplete.

Compare temperature, salinity and pressure together before deciding which water is denser.

Source reference: NOAA | Concept-first teaching edition

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Apply the concepts: predict and explain

1. Heavy rain falls over a warm ocean surface. What happens first?

Surface salinity tends to fall because freshwater dilutes the seawater. Warm temperature does not prevent dilution.



2. Wind moves coastal surface water offshore. What can follow?

Colder water can rise to replace it. This upwelling may lower coastal surface temperature and bring nutrients upward.



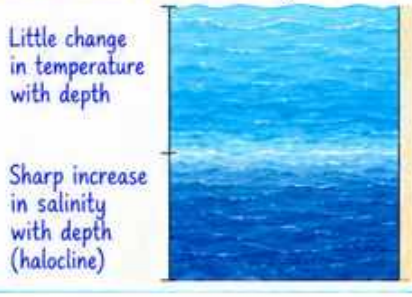
3. A sample loses water by evaporation, with no salt removed. What changes?

Salt concentration rises. The amount of salt need not increase for salitity to increase.



4. A profile shows little temperature change but a sharp salinity increase with depth. Is it unlayered?

No. It has a halocline; temperature alone cannot reveal the full density structure.



5. A salty surface layer lies above fresher water. Must the diagram be impossible?

No. Temperature also matters. Check the combined density before judging stability.



One reasoning route

Identify the process. → Track heat or freshwater. → Predict temperature or salinity. → Consider density and mixing.

Source reference: NOAA | Concept-first teaching edition

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Ocean currents: moving seawater

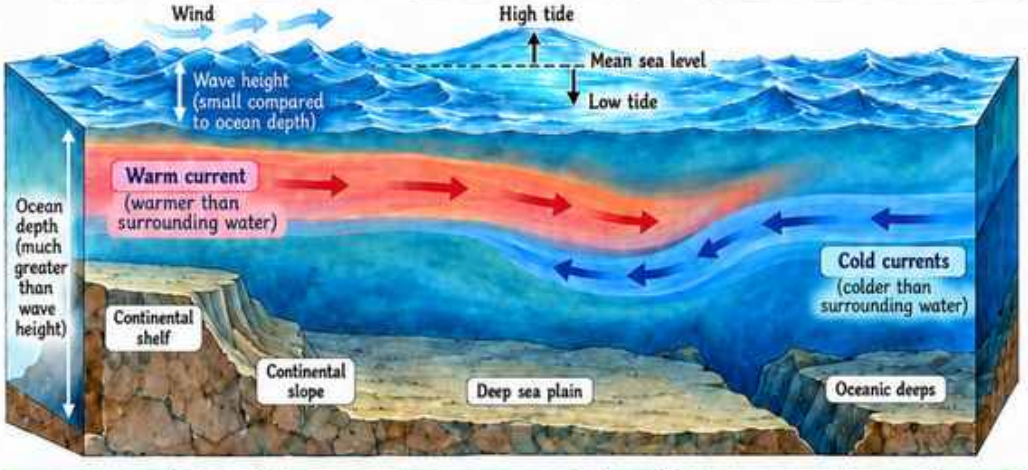
Ocean currents are directed flows of seawater; warm currents bring warm water into colder areas and cold currents bring cold water into warmer areas.

Learn what drives currents, how their routes vary, and how they affect climate, fog and marine life.

WAVES
Short-period up and down movement of water at the surface, mainly due to wind.

TIDES
Regular rise and fall of sea level due to the gravitational pull of the Moon and the Sun.

OCEAN CURRENTS
Continuous flow of huge amounts of ocean water in a definite direction, like a river flow in oceans.

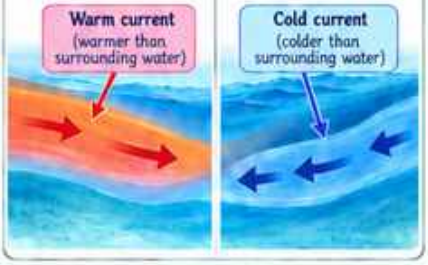


Key differences

Waves	Tides	Ocean currents
		
• Short-period up and down movement of water at the surface • Mainly due to wind • Wave height is small compared to ocean depth	• Regular rise and fall of sea level • Due to gravitational pull of the Moon and the Sun • Vertical movement of water	• Continuous flow of huge amounts of ocean water in a definite direction • Like a river flow in oceans. • Warm currents bring warm water into cold water areas • Cold currents bring cold water into warm water areas • Movement is mostly horizontal

Warm and cold currents

Warm currents	Cold currents
• Carry water that is warmer than the surrounding water. • Bring warm water into cold water areas.	• Carry water that is colder than the surrounding water. • Bring cold water into warm water areas.



How this topic fits with earlier topics

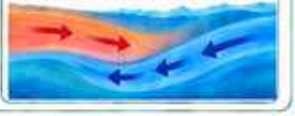
Ocean-floor relief
Continental shelf, continental slope, deep-sea plain and oceanic deeps shape the ocean basin (Topic 144).



Temperature and salinity
Temperature and salinity affect density. Colder or saltier water is generally denser, all else equal (Topic 156).



Water movement
Currents transport water and heat through the ocean.



Sources: Source Index, Topic 165 | Coverage: section 2.1

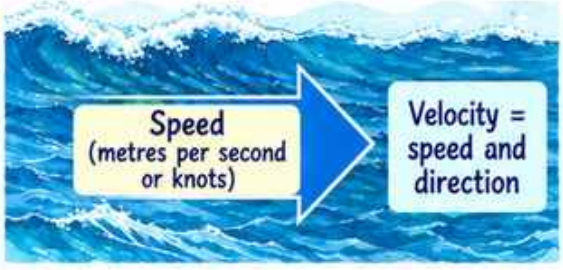
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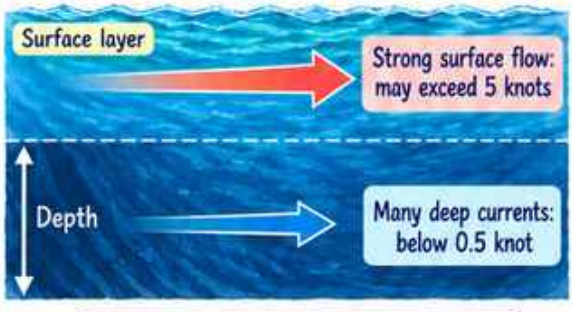
DAY 17 | TOPICS 161-170
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Speed, density and vertical movement

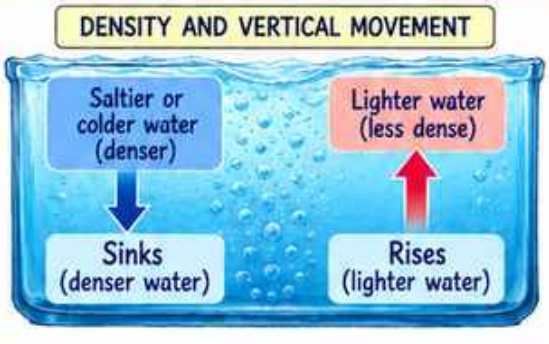
- **Measuring currents**
  Current velocity has both speed and direction.
  Speed is measured in metres per second or knots. One knot is one nautical mile per hour.



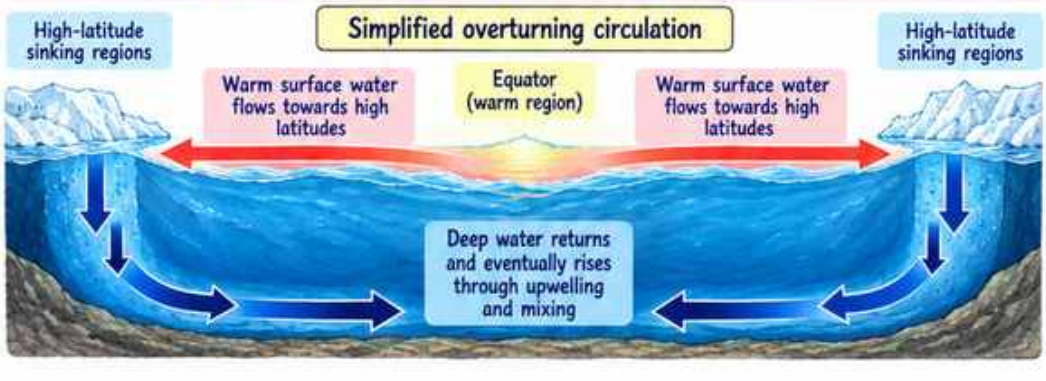
- **Speeds vary**
  Some strong surface currents exceed five knots. Many deep currents are much slower, often below 0.5 knot.
  These are examples, not universal limits.



- **Density and vertical movement**
  At the same pressure, colder or saltier seawater is generally denser, all else equal. Dense water can sink beneath lighter water; winds and mixing also help drive vertical exchange.



- **Overturning circulation, simplified:** warm surface water moves towards high latitudes, cools and may sink in deep-water formation regions. Deep water returns and eventually rises through upwelling and mixing. Actual routes are more complex.



Sources: Source Index, Topic 165 | Coverage: section 2.2

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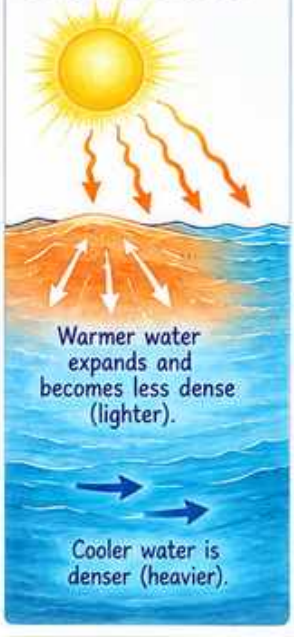
DAY 17 | TOPICS 161-170
Topic 165 | Teaching panel 03

What drives and redirects ocean currents?

Wind transfers momentum to water. Sea-level and density differences create pressure gradients. Earth's rotation redirects motion; continents and the seafloor shape the routes.

1. Solar heating and density

Uneven heating expands seawater and changes its density. Together with salinity, this can create pressure and sea-level differences.



2. Wind stress

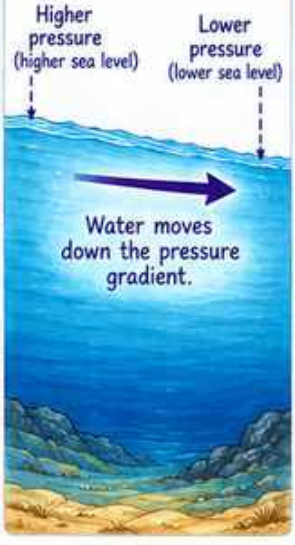
Wind drags the sea surface and transfers momentum.

Persistent winds help organise basin-scale circulation; coastal winds can cause upwelling.



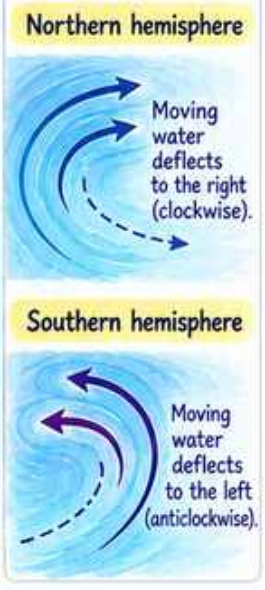
3. Pressure gradients and gravity

Water tends to move from higher pressure towards lower pressure. A sloping sea surface creates a pressure gradient; rotation can balance this in large-scale currents.



4. Coriolis deflection

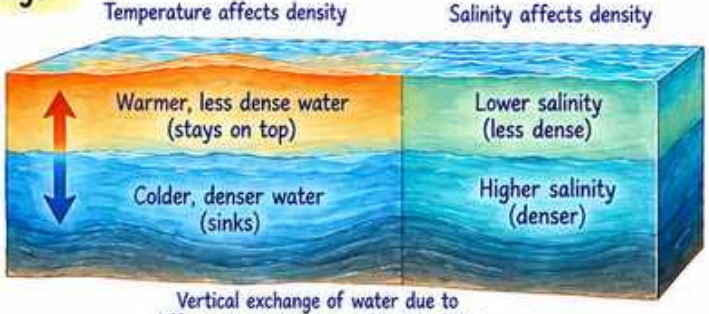
Rotation deflects moving water to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. It redirects motion rather than supplying its energy.



Density and vertical exchange

Temperature and salinity both affect seawater density. Cooling or added salt can make water denser and promote sinking; warmer or fresher water is usually lighter, all else equal.

Wind-driven upwelling and mixing connect surface and deep waters.



Vertical exchange of water due to differences in density, and by wind-driven upwelling and mixing.

Sources: Source Index, Topic 165 | Coverage: section 2.3

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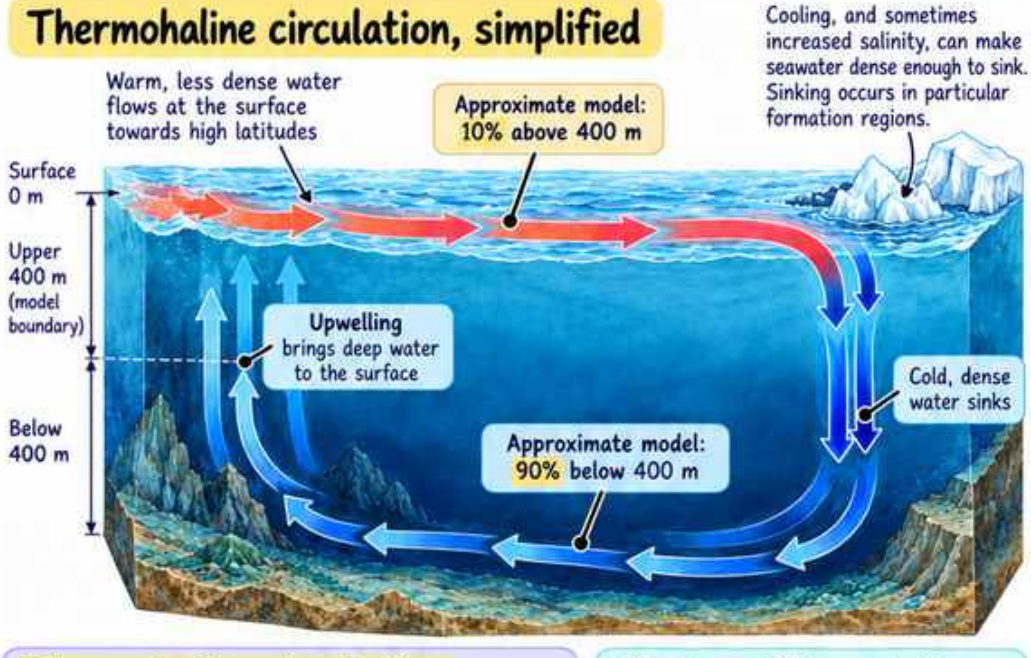
DAY 17 | TOPICS 161-170
Topic 165 | Teaching panel 04

Surface flow, deep flow and overturning circulation

Point	Surface flow (shallow, near-surface)	Deep flow (deep ocean)
Simplified depth-grouping model	About 10% of ocean water	About 90%
Model depth	Upper 400 m	Below 400 m
Main influences	Wind stress, pressure gradients and rotation	Density differences, pressure gradients and mixing
Illustrative speeds	Strong currents may exceed 5 knots	Many flows are slow; an order-of-magnitude example is 1 cm/s

The 400 m and 10%/90% grouping is a simplified teaching model. Actual current depths, speeds and proportions vary; surface and deep waters form connected systems.

Thermohaline circulation, simplified



Thermohaline circulation

Thermohaline circulation is the density-related part of ocean overturning. Heat and freshwater exchanges change density; wind and mixing also help connect the global circulation.

Meaning of thermohaline

- "Thermo" = temperature.
- "Haline" = salinity.



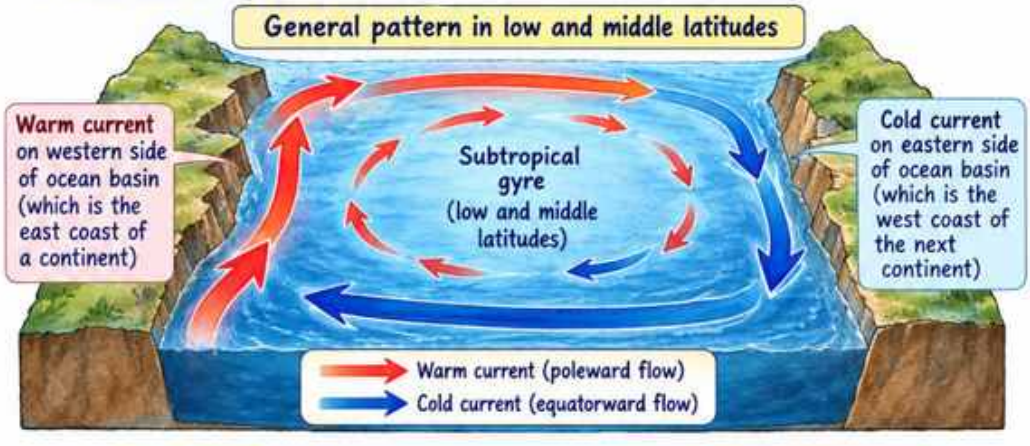
Sources: Source Index, Topic 165 | Coverage: section 2.4

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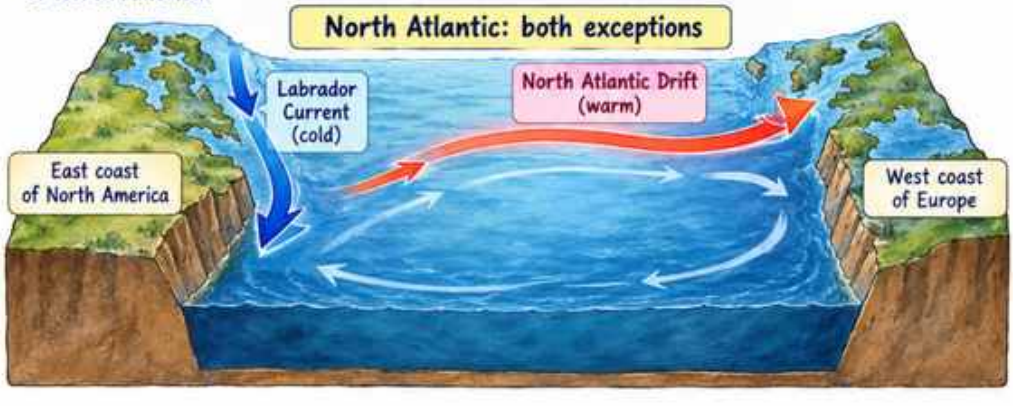
Warm and cold currents: the general pattern

Point	Warm currents	Cold currents
What they do	Bring warm water into cold water areas	Bring cold water into warm water areas
Usual coasts in low and middle latitudes	East coasts of the continents	West coasts of the continents, in both hemispheres
In the higher latitudes of the northern hemisphere	West coasts of the continents	East coasts of the continents
Typical examples	Gulf Stream, North Atlantic Drift, Kuroshio, Agulhas	Labrador, Oyashio, Canary, California, Peru (Humboldt), Benguela

- The **low and middle latitude rule** follows the **gyres (2.6)**: warm water moves poleward along the western side of each ocean basin, which is the east coast of a continent, and cooler water returns towards the equator along the eastern side of the basin, which is the west coast of the next continent.



- In the **North Atlantic** both exceptions can be seen. The warm **North Atlantic Drift** reaches the west coast of Europe, and the cold **Labrador Current** flows south along the east coast of North America.



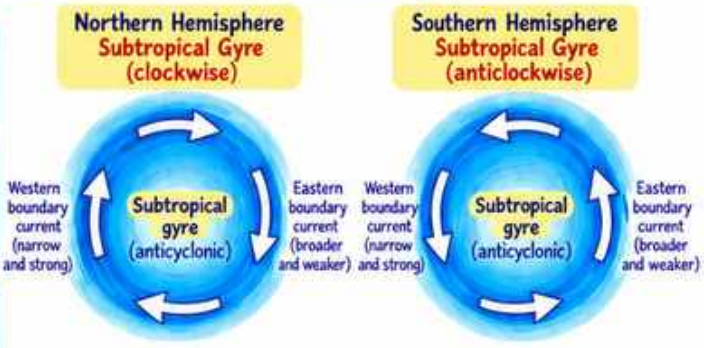
Sources: Source Index, Topic 165 | Coverage: section 2.5

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Gyres and heat transport

How a gyre forms

A gyre is a large rotating system of ocean currents. Wind stress drives surface flow, Earth's rotation deflects it, and continents confine the basin. Subtropical gyres are anticyclonic, while subpolar gyres are cyclonic.

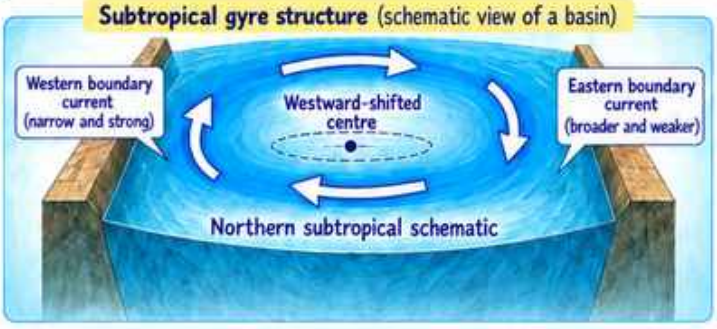


Subpolar gyres

Subpolar gyres rotate in the opposite sense to subtropical gyres. They are cyclonic in the Northern Hemisphere (anticlockwise) and cyclonic in the Southern Hemisphere (clockwise).

Western intensification

Subtropical western boundary currents are typically narrow and strong, while eastern boundary currents are broader and weaker. The Coriolis effect varies with latitude and helps produce this asymmetry. A westward-shifted centre describes the pattern; it is not the physical cause.



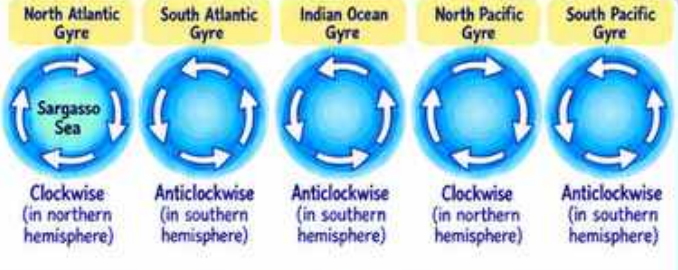
Near the equator

The North and South Equatorial Currents flow mostly westward. Between them the Equatorial Counter Current flows eastward, commonly a little north of the geographic equator.



Major subtropical gyres

- Subtropical gyres turn clockwise in the Northern Hemisphere and anticlockwise in the Southern Hemisphere.
- There are five major subtropical gyres: the North Atlantic, South Atlantic, Indian Ocean, North Pacific and South Pacific.
- The Sargasso Sea lies at the centre of the North Atlantic gyre.



Heat transport

Currents redistribute heat: warm water commonly moves poleward and colder water moves towards lower latitudes. The ocean and atmosphere together transfer heat around the planet.



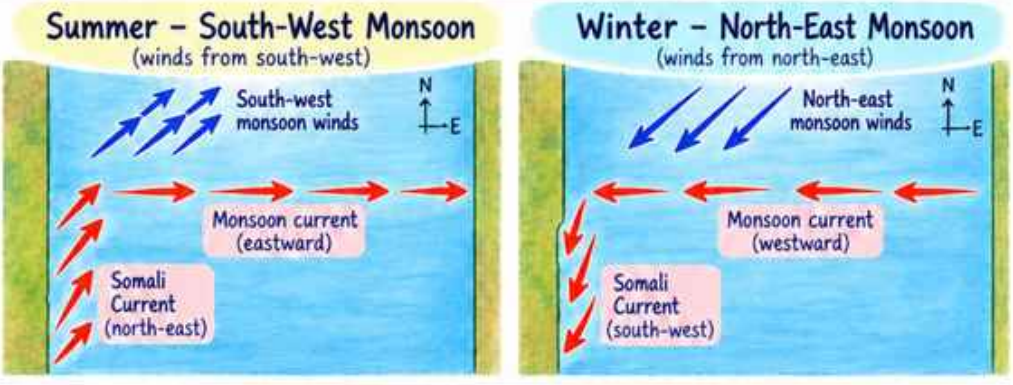
Sources: Source Index, Topic 165 | Coverage: section 2.6

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The Indian Ocean: currents that reverse with the monsoon

Seasonally reversing monsoon winds drive strong surface circulation in the northern Indian Ocean. Several major currents reverse as the winds change.

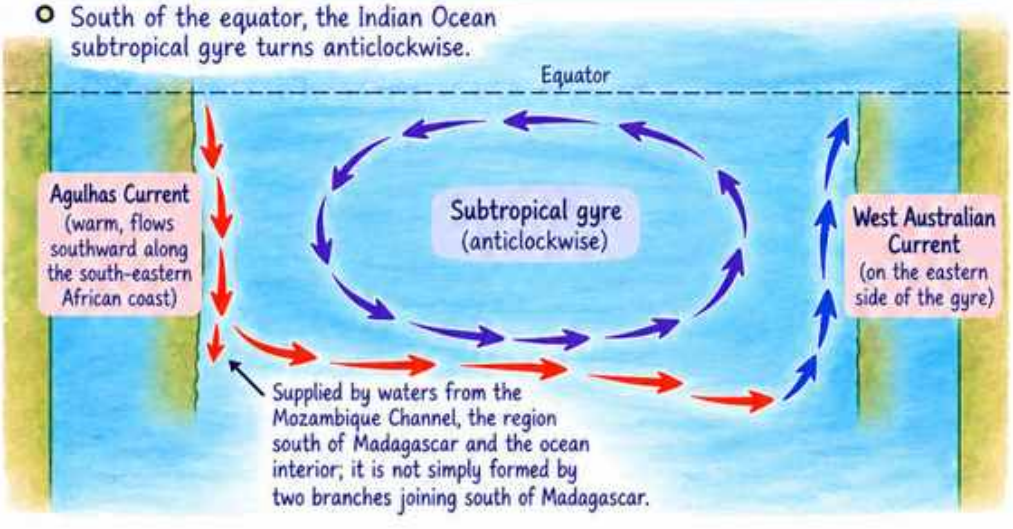
The winds reverse with the seasons (Topic 86): from the south-west in summer and from the north-east in winter. The currents of the north Indian Ocean reverse with them.



Point	South-West Monsoon Current (summer)	North-East Monsoon Current (winter)
Direction	Eastward	Westward
Path	Crosses the Arabian Sea eastward, passes south of Sri Lanka and enters the Bay of Bengal; the route changes through the season.	Flows westward south of Sri Lanka from the Bay of Bengal into the Arabian Sea; its branches and route change through the season.
Somali Current at the same time	Flows north-east along the coast of the Horn of Africa.	Flows south-west, towards the equator.

Currents south of the equator: the Indian Ocean subtropical gyre

- South of the equator, the Indian Ocean subtropical gyre turns anticlockwise.



Sources: Source Index, Topic 165 | Coverage: section 2.7

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Topic 165 | Teaching panel 08

How ocean currents affect coasts and marine life

Currents move heat and water. Together with winds, upwelling and local geography, they influence coastal climate and marine productivity.

Coast or zone	Current water	Mechanism and effect	Examples
West coasts in tropical and subtropical latitudes (except close to the equator)	Cool water	Cools near-surface air, suppresses convection and often favours fog and dry coastal conditions. Atmospheric circulation and relief also matter.	Peru (Humboldt) and Benguela currents.
West coasts in middle and higher latitudes	Warm water	Ocean heat and prevailing winds can moderate winters and reduce seasonal temperature range.	North Atlantic Current and westerlies: north-western Europe.
East coasts in tropical and subtropical latitudes	Warm currents	Supply heat and moisture; with favourable winds, they can support warm, humid coastal climates.	Gulf Stream and Kuroshio.
Frontal and mixing zones	Contrasting water masses	Mixing and nutrient supply can support plankton and productive fisheries. Not all good fishing grounds are mixing zones.	Grand Banks; waters east of Japan.

Mechanisms and examples

Warm current → moisture supply; rainfall also needs suitable winds and uplift.

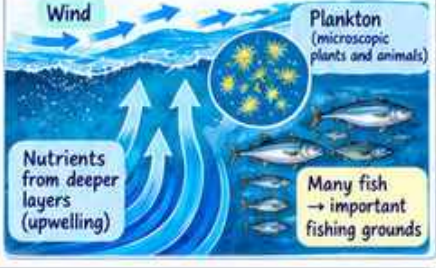


Cool current → stable near-surface air; fog and dryness can occur.



Upwelling, nutrients and fish

Wind-driven upwelling brings nutrient-rich deeper water towards the sunlit surface, supporting plankton and marine food webs.



Coastal deserts (examples)

Atacama Desert

The Atacama is a cool, arid coastal region mainly in northern Chile, beside the Peru Current.



Namib Desert

The Namib is a cool coastal desert about 1,900 km long, from Angola through Namibia into South Africa, beside the Benguela Current.



Sources: Source Index, Topic 165 | Coverage: section 2.8

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Effects of ocean currents (2/2)

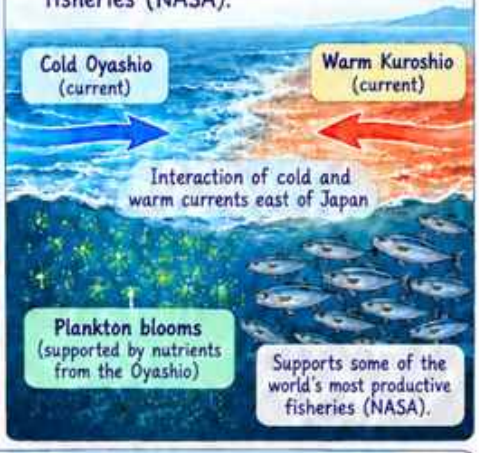
The Grand Banks

- Shallow banks on the continental shelf south-east of Newfoundland, influenced by cold Labrador Current water and warm Gulf Stream waters to the south.
- Dense fog forms when warm, moist air moves over the colder water.
- The banks are important fishing grounds.



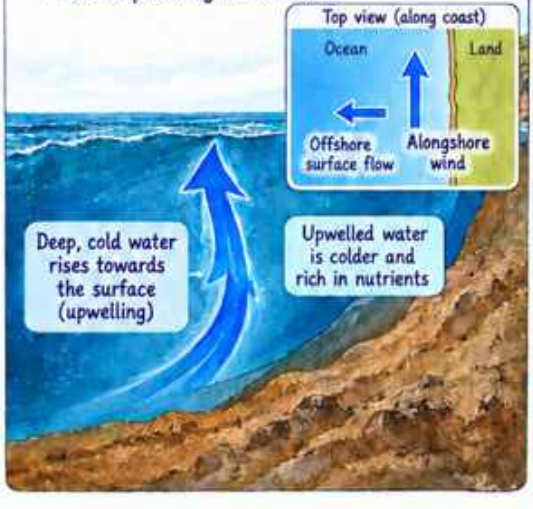
Off Japan

- The cold Oyashio and warm Kuroshio systems interact east of Japan.
- The Oyashio supplies iron and other nutrients; its plankton blooms support some of the world's most productive fisheries (NASA).



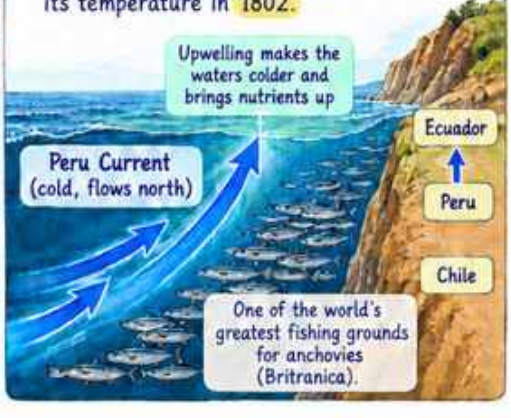
Upwelling (NOAA)

- Deep, cold water rises towards the surface when winds push the surface water away; conditions are best when the winds blow along the shore.
- The upwelled water is colder and rich in nutrients, so good fishing grounds are found where upwelling is common.



The Peru Current

- A cold current that flows north along the west coast of South America, from Chile past Peru towards Ecuador.
- Upwelling of deep water makes it colder still and brings nutrients up, and the waters off Peru, Chile and Ecuador are one of the world's greatest fishing grounds for anchovies (Britannica).
- It is also called the Humboldt Current, after Alexander von Humboldt, who measured its temperature in 1802.

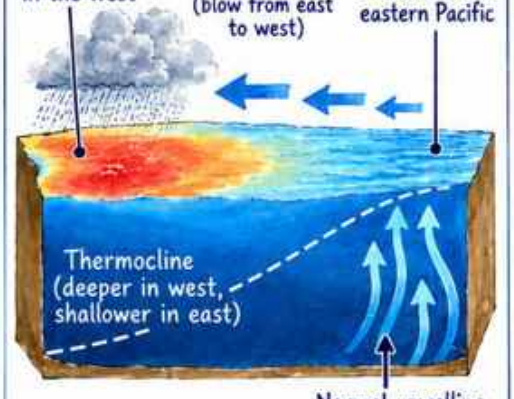


Sources: Source Index, Topic 165 | Coverage: section 2.8

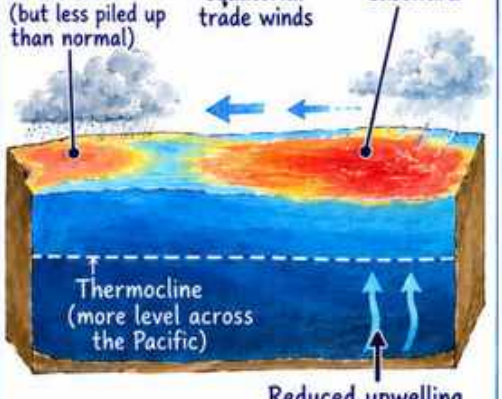
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El Nino in two lines

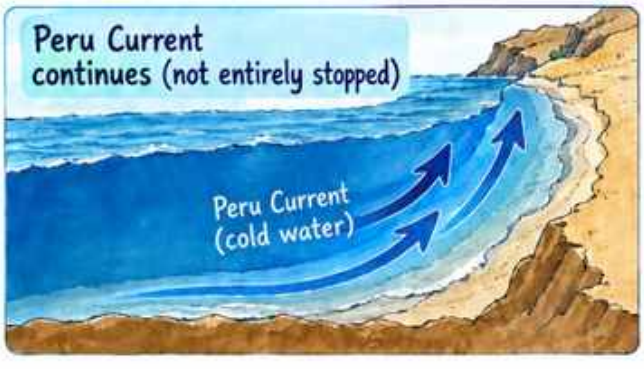
Normal conditions in the tropical Pacific



El Nino conditions in the tropical Pacific



During El Nino, equatorial trade winds weaken, warm surface waters shift eastward and the normal supply of cold, nutrient-rich water to the eastern Pacific surface is reduced. This does not mean that the entire Peru Current stops (NOAA).



El Nino, La Nina and the Southern Oscillation come on Day 37 (Topic 365); tides come on Days 42 and 92.

Sources: Source Index, Topic 165 | Coverage: section 2.9

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Extra section: the major currents, ocean by ocean (1/2)

Ocean	Current		Warm or cold	Where it flows, and what to remember
Atlantic	Gulf Stream		Warm	A powerful western boundary current flowing northward and then north-eastward off North America. The Florida Current feeds the Gulf Stream; its transport near Florida is about 30 million cubic metres per second, not the transport of the entire downstream current.
Atlantic	North Atlantic Drift (North Atlantic Current)		Warm	The north-eastward extension of the Gulf Stream, from south-east of the Grand Banks to the Norwegian Sea; warm and highly saline. Its branches include the Norway and Canary currents.
Atlantic	Labrador		Cold	Flows southward along Labrador and Newfoundland and carries sea ice and icebergs toward the Grand Banks. Its temperature, salinity and iceberg transport vary by season and location.
Atlantic	Canary		Cold	South-westward along the north-west coast of Africa as far as Senegal, then west into the North Equatorial Current. Equatorward alongshore winds drive offshore surface-water transport and coastal upwelling, helping keep the coastal waters cool.
Atlantic	Benguela		Cold	Flows generally northward along the west coast of southern Africa, within the South Atlantic subtropical gyre. The Benguela upwelling system extends through South African and Namibian waters toward southern Angola. Wind-driven upwelling supports plankton and productive fisheries; its water has several source pathways.
Pacific	Kuroshio		Warm	A warm western boundary current of the North Pacific gyre, comparable to the Gulf Stream.
Pacific	Oyashio		Cold	A subarctic current that flows south in the western North Pacific and meets the Kuroshio off the eastern shore of Japan. Its Japanese name means "parent stream": it carries iron and other nutrients, and the plankton blooms on it support some of the most productive fisheries in the world.

Sources: Source Index, Topic 165 | Coverage: section 3

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Extra section: the major currents, ocean by ocean (2/2)

Ocean	Current	Character	Direction and other details	Flow detail
Pacific	California	Cold	Towards the equator, as the eastern boundary current of the North Pacific gyre	
Pacific	Peru (Humboldt)	Cold	North along the west coast of South America, from Chile past Peru towards Ecuador	
Indian	Agulhas	Warm	The western boundary current along south-eastern Africa. It turns back eastward into the Indian Ocean (retroflection), while some water escapes into the South Atlantic, including in eddies. Its sources include Mozambique Channel and South Madagascar waters and the ocean interior	
Indian	Somali	Reverses with the monsoon	Along the Horn of Africa: north-east in summer, south-west in winter	
Indian	South-West and North-East Monsoon Currents	Reverse with the monsoon	Eastward into the Bay of Bengal in summer; westward into the Arabian Sea in winter	
Southern	Antarctic Circumpolar	Flows round Antarctica	Flows west to east around Antarctica and links the Atlantic, Indian and Pacific oceans. Its path varies with longitude; transport estimates depend on the section, observations and method, so 134 million cubic metres per second is not a universal fixed value.	

How to read the table:

- Every warm current in it flows on the western side of its ocean basin, except the North Atlantic Drift, which crosses the ocean to the west coast of Europe.
- Every cold current of the low and middle latitudes in it flows on the eastern side of its basin (Canary, Benguela, California, Peru). The two cold currents of the northern higher latitudes (Labrador, Oyashio) flow on the western side, along an east coast.
- The Gulf Stream, Kuroshio and Agulhas are major western boundary currents of subtropical gyres. The Brazil and East Australian currents are relatively weaker western boundary currents of the South Atlantic and South Pacific gyres.

Sources: Source Index, Topic 165 | Coverage: section 3

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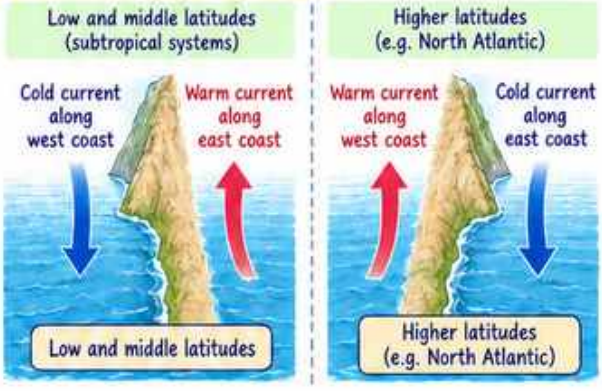
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Topic 165 | Teaching panel 13

Three current misconceptions

1 "Cold currents do not always follow west coasts."

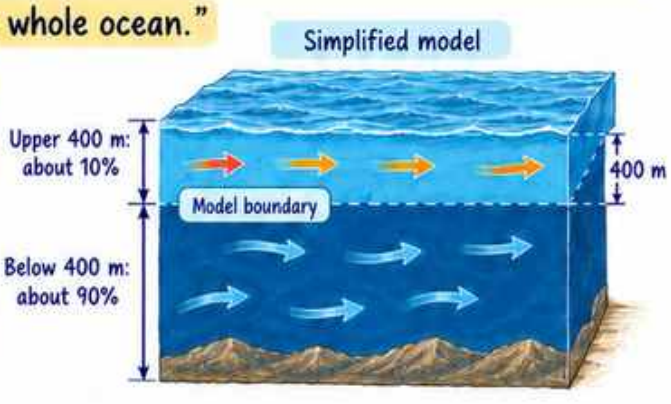
In many low- and middle-latitude subtropical systems, cold currents flow along west coasts of continents and warm currents along east coasts. Higher-latitude examples differ: the Labrador Current is cold along eastern North America; the North Atlantic Current brings warm water towards western Europe. These are broad patterns, not universal coast rules.



2 "Surface flow is not the whole ocean."

A simplified depth-grouping model assigns about 10% of ocean water to the upper 400 m and about 90% below. Actual current depths and volume shares vary. Surface and deep circulation are connected.

A current-depth grouping is different from the thermocline, a layer with a rapid temperature change; its depth varies by place and season.

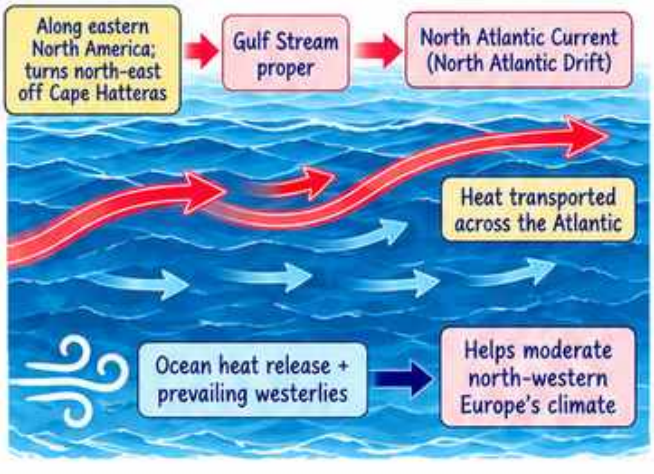


3 "One connected current system, distinct names."

The Gulf Stream flows along eastern North America and turns north-east off Cape Hatteras. The North Atlantic Current, also called the North Atlantic Drift, continues the warm-water transport across the Atlantic.

Ocean heat release and prevailing westerlies together help moderate north-western Europe's climate.

Use the current name precisely, while recognising the connected heat-transport system.



Sources: Source Index, Topic 165 | Coverage: section 4

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IAS WITH DR RAVI
AIM. PREPARE. ACHIEVE

DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 01

Three sectors: classify the activity (1/2)

Economic activities can be grouped into sectors in three ways: by the nature of the activity (primary, secondary and tertiary, with quaternary and quinary activities as the higher levels of services), by the conditions of employment (organised and unorganised) and by the ownership of assets (public and private).

Ask what is produced, how the work is organised, and who owns the enterprise. These are different questions.

Measuring output

GVA at basic prices is output minus intermediate consumption, so it avoids double counting. Sector output and employment shares may differ sharply.

For the February/June 2026 release-vintage comparison and 2025 employment data, see panels 06–08.

Example chain: from primary to tertiary



Primary sector
Cotton grown on a farm (a natural product)

Secondary sector
Spinning yarn and weaving cloth from cotton fibre

Textiary sector
Transport, storage, communication, banking and trade

Point	Primary sector	Secondary sector	Tertiary sector
Main activity	Obtains products directly from natural resources.	Transforms materials into goods; also includes construction and utilities in the grouping shown.	Provides services to producers and consumers.
Common description	Agriculture and resource-based activities	Industry	Services
Examples	Cotton grown on a farm, a natural product	Spinning yarn and weaving cloth from cotton fibre	Transport, storage, communication, banking, trade
National-accounts grouping (MoSPI)	Agriculture, livestock, forestry and fishing; mining and quarrying	Manufacturing; electricity, gas, water supply and other utiities; construction	Trade, hotels, transport, communication, storage and broadcasting; financial, real estate, IT and professional services; ownership of dwellings; public administration, defence and other services

Mining and quarrying



Mining and quarrying extract natural resources and belong to the primary sector in this three-sector grouping.

Construction and electricity





Construction and utilities belong to the secondary sector in this grouping.

These sector groupings are used in India's national accounts compiled by the Ministry of Statistics and Programme Implementation (MoSPI). Other statistical systems may use different categories.

Sources: Source Index, Topic 166 | Coverage: section 2.1

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DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 02

Three sectors: extraction, transformation and services (2/2)

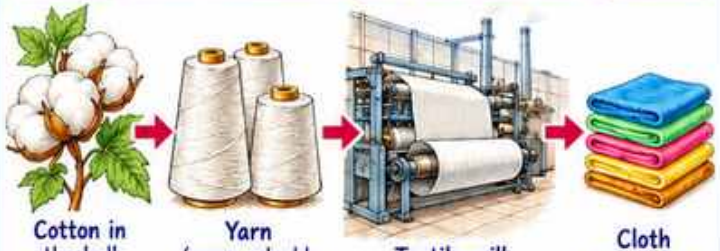
Primary activities directly use natural resources. Examples include hunting and gathering, pastoral activities, fishing, forestry, agriculture, mining and quarrying.

Examples of primary activities



Secondary activities add value by transforming raw materials into products. Cotton in the boll has limited direct use; spinning it into yarn and weaving yarn into cloth creates more useful products.

Example: from cotton to yarn to cloth to a product



The sectors depend on one another

A sugar mill depends on sugarcane from farmers. Transport and trade connect the farm, factory and consumer. If the mill cannot obtain sugarcane, production must stop.



Primary sector
Agriculture
(sugarcane grown by farmers)

Secondary sector
Sugar mill
(transforms sugarcane into sugar)

Tertiary sector
Trade, transport and services
(sugar transported and sold in shops)

A sugar mill depends on sugarcane from farmers. Transport and trade connect the farm, factory and consumer. If the mill cannot obtain sugarcane, production must stop.

Sources: Source Index, Topic 166 | Coverage: section 2.1

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IAS WITH DR RAVI
AIM. PREPARE. ACHIEVE

DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 03

Services, knowledge work and high-level decisions

Quaternary and quinary describe specialised parts of services in one five-sector model. Their boundaries overlap; job titles do not form universal, exclusive bins.

Tertiary: services

Services for consumers and other producers rather than mainly manufacturing tangible goods.

Examples

Doctors, teachers, lawyers, plumbers, electricians, barbers, shopkeepers and drivers.



Point to remember

Includes trade, transport, communication and personal or professional services.

Quaternary: knowledge work

Collects, produces, processes or shares information; includes research, development and specialised technical knowledge.

Examples

Software development, statistics, data analysis, research and specialised financial or tax analysis.



Point to remember

Such work occurs in offices, universities, hospitals and many industries.

Quinary: high-level decisions

Uses specialised knowledge to set strategy, policy or major directions; evaluates ideas, evidence and technology.

Examples

Senior executives, senior public officials, leading researchers and high-level professional advisers, depending on their actual role.



Point to remember

A small number of decisions can have wide effects. 'Gold-collar' is sometimes used as occupational shorthand.

Activity matters more than the job title

A teacher provides education; research work is knowledge-intensive; setting university-wide policy involves high-level decisions. One person or institution can perform more than one kind of activity.



Services and development

Service and knowledge-intensive employment often expand as economies develop. The proportions depend on country, year and definition; this model does not imply a fixed employment share.



Sources: Source Index, Topic 166 | Coverage: section 2.2

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IAS WITH DR RAVI
AIM. PREPARE. ACHIEVE

DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 04

Collar labels: occupational shorthand

Collar colours are informal labels. Meanings vary by context, and they are not a universal official classification of economic sectors. Classify an activity by what it does.



Red-collar: a geographical usage

Used in this geographical classification for outdoor primary work, such as farming, forestry and resource extraction. Other contexts may use the colour differently.





Blue-collar

Manual, production and skilled-trade work. Examples include machine operators, factory production workers and repair trades.





White-collar

Office, administrative and professional work. Examples include accountants, analysts and professional specialists. High-technology firms can employ many such specialists alongside production workers.





Gold-collar: a specialised usage

Highly skilled knowledge work or high-level decision roles. In the five-sector model here, it is associated with quinary work; the term has no single universal boundary.



Occupation is not the same as sector

1. A factory can employ blue-collar production workers and white-collar accountants.



2. A technician may work in manufacturing or services; examine the activity.



3. A collar label does not determine public/private ownership or organised/unorganised employment.



Sources: Source Index, Topic 166 | Coverage: section 2.3

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IAS WITH DR RAVI
AIM. PREPARE. ACHIEVE

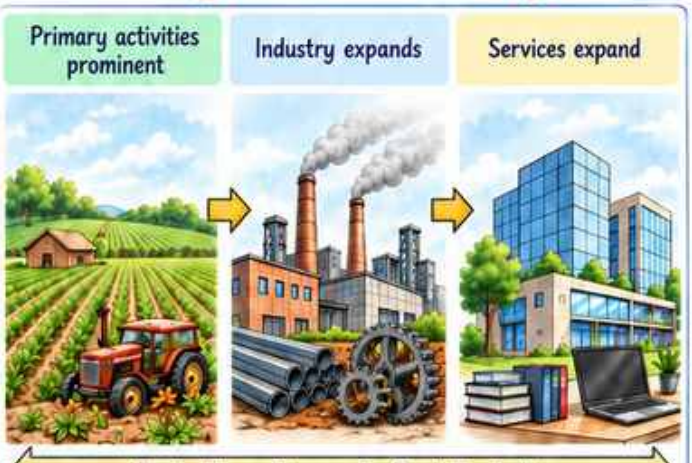
DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 05

How sectoral structure changes with development

The three-sector hypothesis

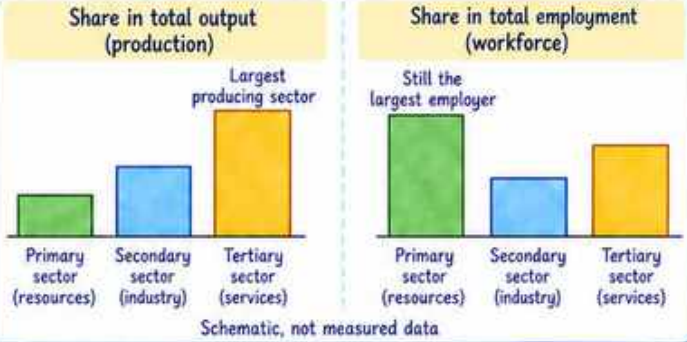
A common historical pattern is a declining relative role for primary activities, expansion of manufacturing, and later growth of services. Countries differ in timing and may not follow an identical sequence.

Associated with Allan Fisher (1935), Colin Clark's The Conditions of Economic Progress (1940), and Jean Fourastié's Le grand espoir du XXe siècle (1949).



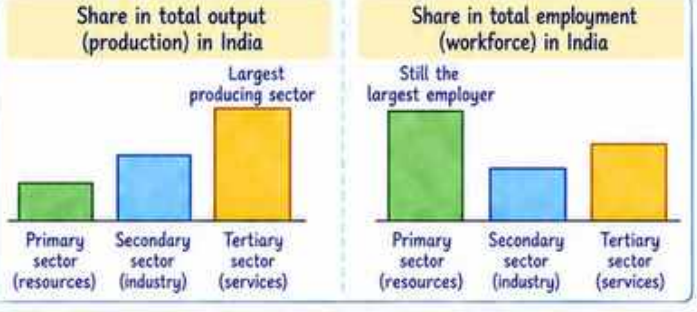
Output and jobs can shift at different speeds

A sector can gain output share without gaining the same employment share. Productivity, demand, technology and movement of workers all affect the pattern.



India: different patterns for output and jobs

In the dated comparison on panels 06–08, services have the largest GVA share, while the primary sector employs the largest share of workers. The GVA figures use the February/June 2026 release vintage; employment refers to 2025.



Read two measures

Output share measures a sector's contribution to production. Employment share measures its share of workers. A change in one does not automatically imply the same change in the other.

Sources: Source Index, Topic 166 | Coverage: section 2.4

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IAS WITH DR RAVI
AIM. PREPARE. ACHIEVE

India's shares in output and in employment (1/2)

Share in GVA at basic prices, current prices

(per cent; MoSPI, base year 2022-23; February/June 2026 release vintage, not the latest revised series)

Sector	2022-23	2024-25 (First Revised Estimates)	2025-26 (Provisional Estimates)
Primary	22.1	21.4	19.9
Secondary	26.0	25.8	25.8
Tertiary	51.8	52.9	54.3

- Compare the 2022-23 and 2024-25 sector shares at current prices.
- For 2025-26, each share equals sector GVA divided by total GVA of Rs 3,14,86,840 crore, multiplied by 100.
- Within the primary sector of 2025-26, agriculture, livestock, forestry and fishing were about 18.0 per cent of GVA and mining and quarrying about 1.9 per cent.
- The earlier February 2026 advance estimate for agriculture and allied activities was about 17.9%; the provisional estimate is 18.0%.
- Release-vintage note: these February/June 2026 estimates were later revised on 31 August 2026. They are not the latest sector shares.

Sector shares in GVA
(at basic prices, current prices)



Components of the primary sector in 2025-26
(share in total GVA)



Agriculture, livestock, forestry and fishing about 18.0%

Mining and quarrying about 1.9%

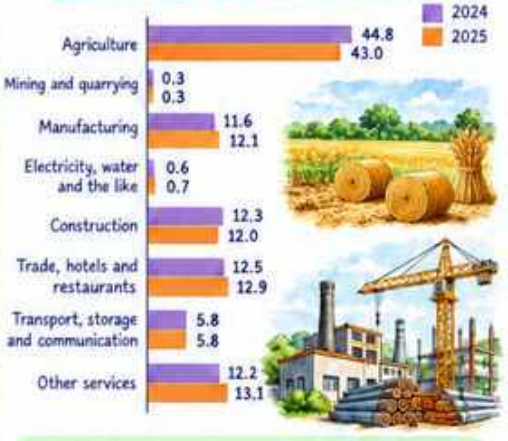
Primary sector total: 19.9% of GVA in 2025-26

Share in employment

(per cent of workers; PLFS Annual Report 2025, released on 27 March 2026; usual status, all-India)

Industry of work	2024	2025
Agriculture	44.8	43.0
Mining and quarrying	0.3	0.3
Manufacturing	11.6	12.1
Electricity, water and the like	0.6	0.7
Construction	12.3	12.0
Trade, hotels and restaurants	12.5	12.9
Transport, storage and communication	5.8	5.8
Other services	12.2	13.1
Primary (agriculture with mining), worked out	45.1	43.3
Secondary (manufacturing, electricity and construction), worked out	24.5	24.8

Share in employment (per cent of workers)



Primary (agriculture with mining), worked out
45.1% (2024) **43.3%** (2025)

Secondary (manufacturing, electricity and construction), worked out
24.5% (2024) **24.8%** (2025)

Sources: Source Index, Topic 166 | Coverage: section 2.5

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AIM. PREPARE. ACHIEVE

DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 07

India's shares in output and in employment (2/2)

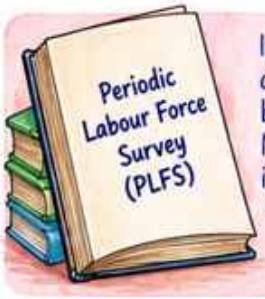
Tertiary (services) employment share

Per cent of workers



What the tertiary (services) sector includes





Industry employment shares can be added into three broad sectors using the MoSPI grouping introduced in 2.1.

The 2025 rows add up to 99.9 because of rounding.



From 2025 the PLFS covers the calendar year and uses a new sample design; MoSPI cautions that the 2025 estimates may not be strictly comparable with those of earlier years.

Sources: Source Index, Topic 166 | Coverage: section 2.5

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IAS WITH DR RAVI
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Topic 166 | Teaching panel 08

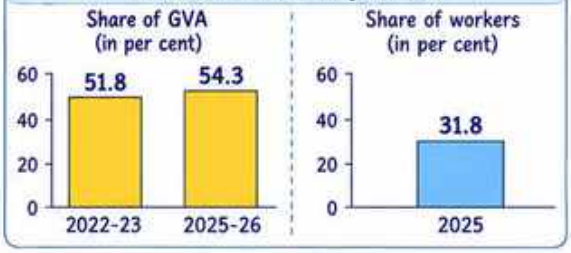
Services-led growth and disguised unemployment

1. Output and employment shares differ

The services sector's share of GVA rose from 51.8 per cent in 2022-23 to 54.3 per cent in 2025-26, but its share of workers was only 31.8 per cent in 2025.

GVA at current prices: February/June 2026 release vintage, base year 2022–23, later revised. Employment: PLFS 2025.

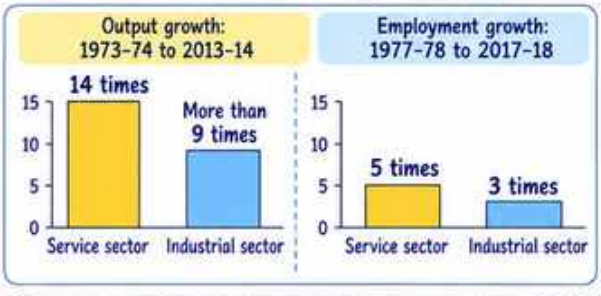
Share of Gross Value Added (GVA) and workers in the services (tertiary) sector



2. Historical output and job growth

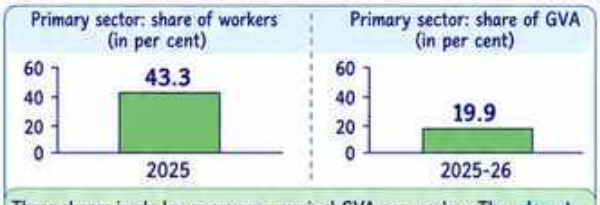
Services output grew about 14 times, industrial output more than 9 times. Service employment grew about 5 times, industrial employment about 3 times.

Different 40-year windows: this illustrates uneven output and job growth, not a matched-period growth ratio.



3. Primary-sector shares

The primary sector still has the largest share of workers (43.3 per cent in 2025) but less than one-fifth of GVA (19.9 per cent in 2025-26).



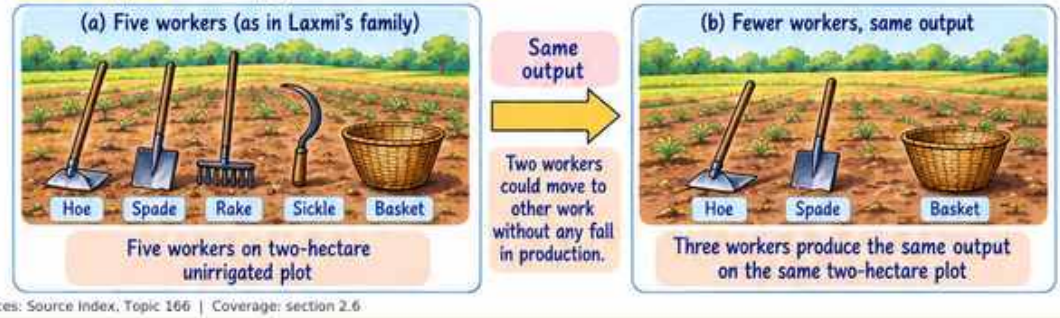
These shares imply lower average nominal GVA per worker. They do not by themselves measure marginal output or establish disguised unemployment.

4. Disguised unemployment

More people work on a task than are needed for its current output. Some could move to other work without reducing production.

Laxmi's family of five, all working on a two-hectare unirrigated plot; two of them could move to other work without any fall in the farm's production.

They are counted as employed, so disguised unemployment does not appear as unemployment in the usual rate.



Sources: Source Index, Topic 166 | Coverage: section 2.6

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DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 09

Employment conditions and ownership: two different classifications

Ask two separate questions: how is work organised, and who owns the enterprise?

Conditions of employment

Organised sector

Formal, registered enterprises with regular employment arrangements and applicable labour protections.

Benefits may include paid leave, provident fund or gratuity, subject to coverage and eligibility.



Unorganised sector

Often small, dispersed or self-employed activities. Work may be irregular and social protection or enforcement weaker.

Examples include street sellers and casual repair, painting or plumbing work.

Labour rules can still apply.



Historical and current context: Historical examples of labour legislation include the Factories Act, Minimum Wages Act and Payment of Gratuity Act. Four Labour Codes took effect from **21 November 2025**; current coverage depends on the applicable Code, rules and circumstances. State shops-and-establishments laws also matter.

Ownership of assets

Public sector

Government ownership or control.

Examples: Indian Railways and the post office.

Public services can pursue social goals as well as financial objectives.

Infrastructure often needs large, long-term investment.



Private sector

Ownership or control by private individuals or companies.

Examples: Tata Steel (formerly TISCO) and Reliance Industries Limited.



Key point: A private company can be organised, and a public enterprise can employ workers under different arrangements. Public/private ownership is not the same classification as organised/unorganised work.

Sources: Source Index, Topic 166 | Coverage: section 2.7

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AIM. PREPARE. ACHIEVE

DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 10

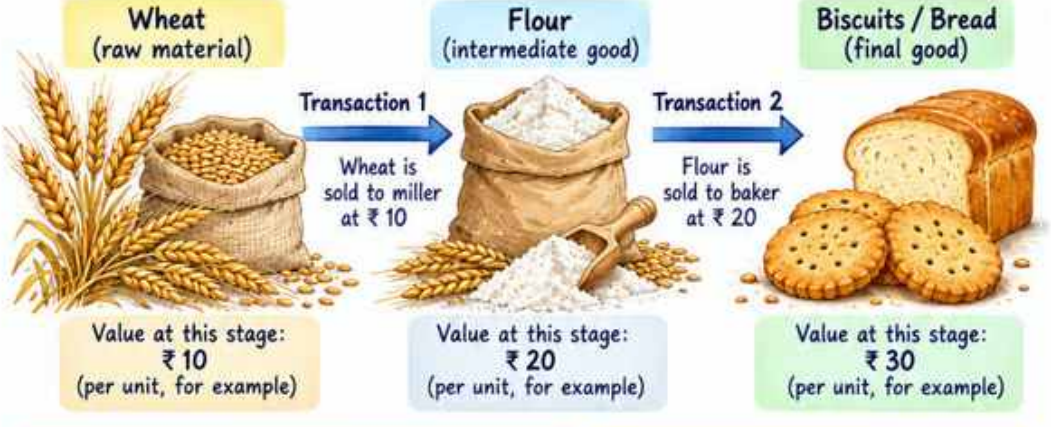
Counting each sector's output once

GDP counts only final goods and services.

Example: wheat is made into flour, then biscuits: only the value of the **biscuits**, the **final good**, is counted, because it already includes the value of the flour and the wheat. Counting the intermediate goods as well would be **double counting**.

MoSPI therefore measures each sector's output as **GVA**: the value of output minus the value of intermediate consumption (Topic 5).

GVA = Value of output − Value of intermediate consumption



Why only the final good is counted in GDP?

- The biscuits (final good) already include the value of the flour and the wheat.
- If we also counted the intermediate goods (wheat and flour), their value would be counted more than once.
- This would be **double counting**, which gives an inflated measure of output.

How GVA avoids double counting

- MoSPI measures each sector's output as **GVA** (Gross Value Added).
- It is the value of output minus the value of intermediate consumption (Topic 5).

GVA = Value of output − Value of intermediate consumption

Covered on other days:



Sources: Source Index, Topic 166 | Coverage: section 2.8

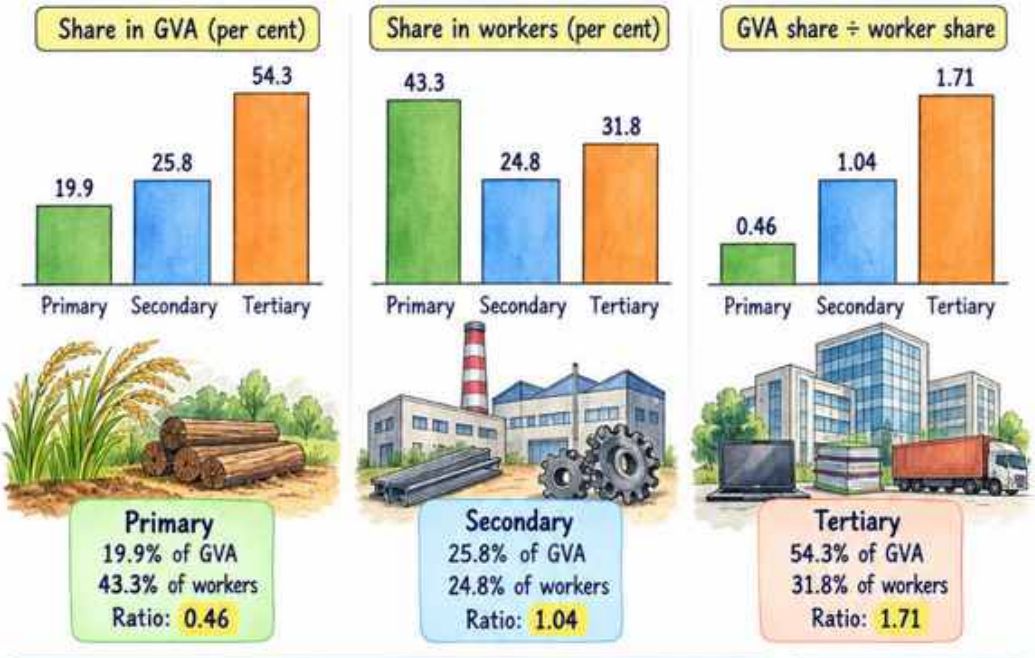
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Extra section: worked example, share in output against share in workers

Take the dated shares in 2.5: current-price GVA for 2025-26 from the June 2026 release and workers for calendar 2025. The periods do not match exactly. Their ratio is only an **approximate index** of nominal GVA per worker relative to the economy-wide average; it is not a measure of physical productivity, hourly productivity or marginal productivity.

Sector	Share in GVA (per cent)	Share in workers (per cent)	GVA share ÷ worker share
Primary	19.9	43.3	0.46
Secondary	25.8	24.8	1.04
Tertiary	54.3	31.8	1.71



How to read it:

- A ratio of 1 means the sector's share in output equals its share in workers. Below 1, output per worker is below the economy's average; above 1, it is above the average.
- The primary sector's ratio of 0.46 means that its workers produce, on average, less than half of the output of an average worker in the economy.
- Output per worker in the tertiary sector is about 3.7 times that in the primary sector (1.71 ÷ 0.46).
- Disguised unemployment is a separate claim: some workers could leave without reducing output. If that condition holds, output per remaining worker rises. The ratios above alone do not show that the condition holds.

Agriculture alone

The same check, done with agriculture alone (about 18.0 per cent of GVA and 43.0 per cent of workers), gives a ratio of about 0.42.



Sources: Source Index, Topic 166 | Coverage: section 3

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DAY 17 | TOPICS 161-170
Topic 166 | Teaching panel 12

Three distinctions in sector data

1 Primary sector also includes mining and quarrying.

Share in Gross Value Added (GVA) for 2025-26 (MoSPI)

19.9%



Primary sector (about 19.9 per cent of GVA)

18.0%



Agriculture and allied activities (about 18.0 per cent of GVA)

Share of workers in PLFS for 2025
Agriculture, forestry and fishing

43.0%



Agriculture, forestry and fishing (43.0 per cent of workers)

GVA: February/June 2026 release vintage, later revised; current prices, base year 2022-23.

Employment: PLFS 2025. Usual status, January-December 2025.

Primary includes agriculture and allied activities plus mining and quarrying in the three-sector grouping shown. Read the measure, year and row label before quoting a share.

2 Conceptual subdivisions and statistical groups.

Five-sector model



Quaternary = knowledge-intensive activities.

Quinary = high-level decisions.

They are specialised parts of services, with overlap.

MoSPI's three-sector grouping

- Primary sector
- Secondary sector
- Tertiary sector

Knowledge-based services are included within the tertiary sector; quaternary and quinary are not separate rows in this grouping.

3 Occupation labels do not determine the sector.

Red collar



Outdoor primary work in one geographical usage.

Blue collar



Production, manual or trade work.

White collar



Office and professional work.

Gold collar



Specialised knowledge or high-level decision roles.

Collar labels are informal and context-dependent.

Classify the actual activity; a factory may employ both production workers and accountants.

Sources: Source Index, Topic 166 | Coverage: section 4

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AP protected-area context

Andhra Pradesh protects its wildlife through national parks, wildlife sanctuaries and a tiger reserve, all made under the Wild Life (Protection) Act, 1972. The examination asks how these categories differ in law, how many the State has, and which protected area is known for which species or habitat.



Great Indian Bustard
Critically Endangered

Topic 37 (Day 4)
taught biodiversity at three levels and the IUCN Red List categories. Two birds of this topic, the Great Indian Bustard and Jerdon's Courser, are Critically Endangered.



Jerdon's Courser
Critically Endangered

Topic 157 (Day 16)
taught the Environment (Protection) Act, 1986, an umbrella law, and Article 48A on safeguarding forests and wild life. Protected areas are made under a different and older law: the Wild Life (Protection) Act, 1972 (Act No. 53 of 1972). Legal baseline: 5 June 2025, including the 2022 amendment. The Act in detail is Topic 197.



Districts: this topic uses the districts of Andhra Pradesh as they stand on 18 October 2026: the 26 districts formed on 4 April 2022, and the two districts added on 31 December 2025, making 28 (Topic 45). Earlier district names may differ from the current districts.

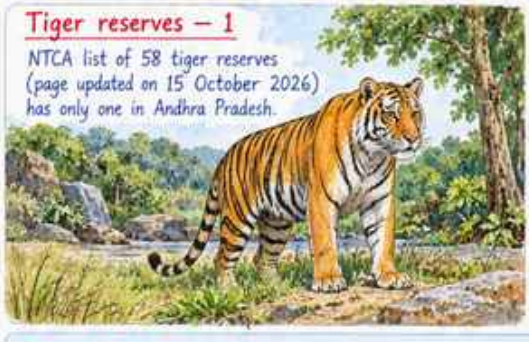
Category	Figure	Source and date
National parks	3	Andhra Pradesh Forest Department website (page undated; read on 18 October 2026)
Wildlife sanctuaries	13	Andhra Pradesh Forest Department; the same count of 13, with a total area of 6,771.40 sq km, in the Ministry of Environment, Forest and Climate Change (MoEFCC) protected area data, as on February 2025
Tiger reserves	1	Andhra Pradesh Forest Department; the NTCA list of 58 tiger reserves (page updated on 15 October 2026) has only one in Andhra Pradesh
Elephant reserve	1	Andhra Pradesh Forest Department, which names the Koundinya Sanctuary and the Rayala Elephant Reserve



National parks — 3



Wildlife sanctuaries — 13
Total area of 6,771.40 sq km (as on February 2025)



Tiger reserves — 1
NTCA list of 58 tiger reserves (page updated on 15 October 2026) has only one in Andhra Pradesh.



Elephant reserve — 1
Koundinya Sanctuary and the Rayala Elephant Reserve

Second tiger reserve: as on 15 October 2026 the NTCA list shows no second tiger reserve in Andhra Pradesh.

Sources: Day 18 Source Index | Topic 175 | 1; 2.1; 2.4

Day 18 | T175 · P01 | 64/155

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Sanctuary versus national park



Kind	Section	Who declares it	On what land	What the Act says about use
Wildlife sanctuary	18 and 26A	State Government: intention under section 18; final declaration under section 26A.	Any area, other than an area within a reserve forest or the territorial waters, that is of adequate ecological, faunal, floral or other significance for protecting wild life (an area within a reserve forest or the territorial waters is declared a sanctuary under section 26A(1)(b) instead)	The Chief Wild Life Warden "may regulate, control or prohibit, in keeping with the interests of wild life, the grazing or movement of live-stock" (section 33(d))
National park	35	State Government: intention under section 35(1); final declaration under section 35(4), after statutory conditions are met.	An area the State Government chooses for a national park	"No grazing of any live-stock shall be permitted in a National Park" (section 35(7)). Destruction, exploitation or removal of wildlife, including forest produce, is prohibited except through the restricted permit procedure in section 35(6)

The key difference:
in a sanctuary, grazing may be regulated, controlled or prohibited; in a national park, grazing of livestock is not permitted at all. A national park is the stricter category.

Legal qualification:
section 35(6) contains a restricted permit exception for removal of wildlife or forest produce. The Chief Wild Life Warden issues the permit only after State Government authorisation in consultation with the National Board, for improvement and better management of wildlife. This does not remove the livestock-grazing ban in section 35(7).

Section 38 also allows the Central Government to declare protected areas in the circumstances specified there.



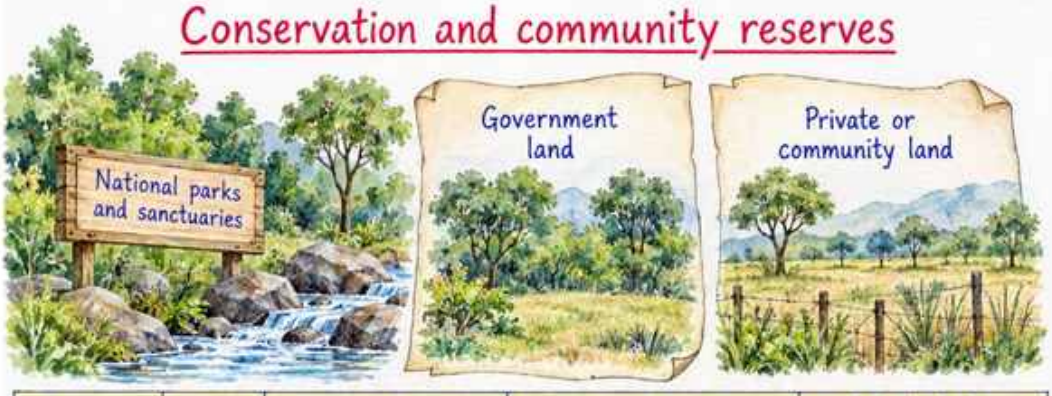
Sources: Day 18 Source Index | Topic 175 | 2.2

Day 18 | T175 · P02 | 65/155

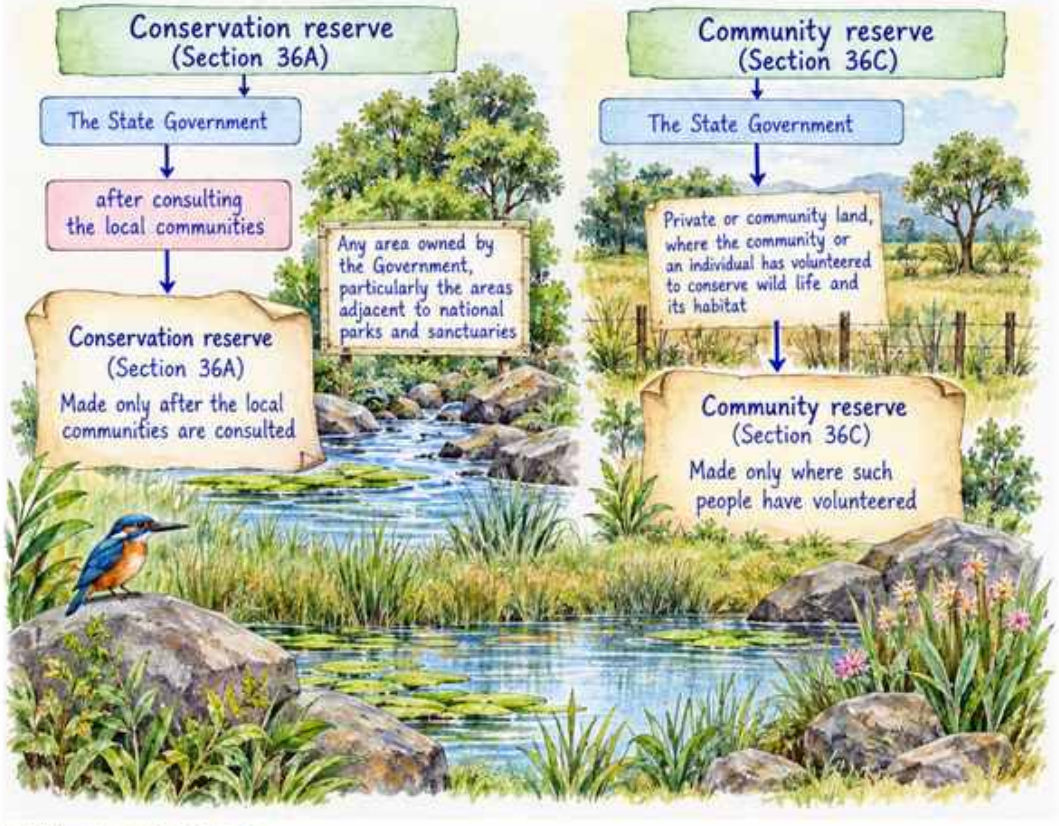
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Conservation and community reserves



Kind	Section	Who declares it	On what land	What the Act says about use
Conservation reserve	36A	The State Government, after consulting the local communities	Any area owned by the Government, particularly the areas adjacent to national parks and sanctuaries	Made only after the local communities are consulted
Community reserve	36C	The State Government	Private or community land, where the community or an individual has volunteered to conserve wild life and its habitat	Made only where such people have volunteered



Sources: Day 18 Source Index | Topic 175 | 2.2

Day 18 | T175 · P03 | 66/155

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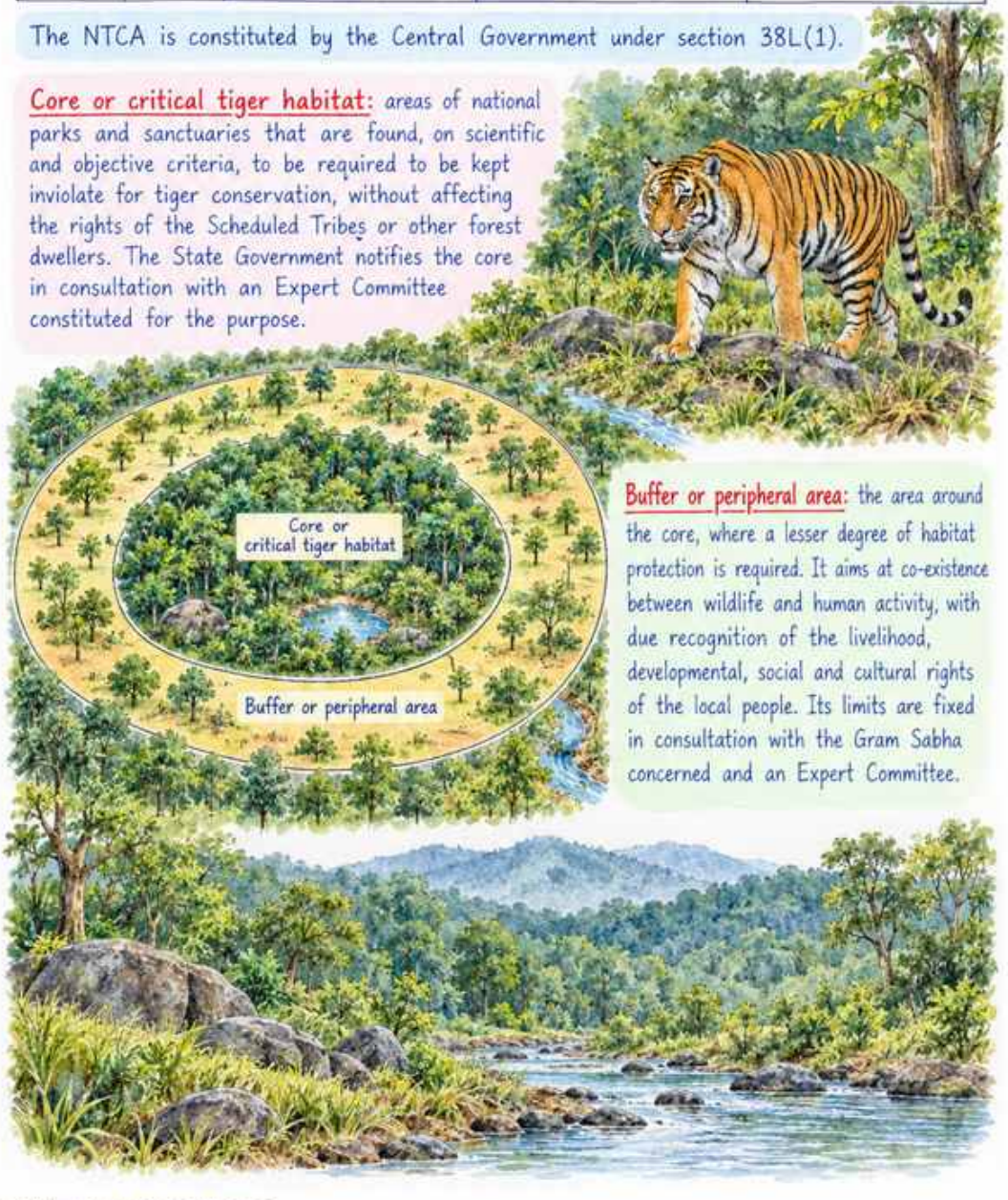
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Tiger reserve law

Kind	Section	Who declares it	On what land	What the Act says about use
Tiger reserve	38V	The State Government, on the recommendation of the National Tiger Conservation Authority (NTCA)	Core or critical tiger habitat areas of national parks and sanctuaries, with a buffer or peripheral area around them	Core kept inviolate for tigers; buffer for co-existence (see 2.3)

The NTCA is constituted by the Central Government under section 38L(1).

Core or critical tiger habitat: areas of national parks and sanctuaries that are found, on scientific and objective criteria, to be required to be kept inviolate for tiger conservation, without affecting the rights of the Scheduled Tribes or other forest dwellers. The State Government notifies the core in consultation with an Expert Committee constituted for the purpose.



Buffer or peripheral area: the area around the core, where a lesser degree of habitat protection is required. It aims at co-existence between wildlife and human activity, with due recognition of the livelihood, developmental, social and cultural rights of the local people. Its limits are fixed in consultation with the Gram Sabha concerned and an Expert Committee.

Sources: Day 18 Source Index | Topic 175 | 2.2; 2.3

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Tiger plans and relocation safeguards

Tiger Conservation Plan:

the State Government prepares one for each tiger reserve (section 38V(3)), and must ensure the agricultural, livelihood, developmental and other interests of the people living in tiger bearing forests or a tiger reserve (section 38V(4)).





No forced resettlement:

except for voluntary relocation on mutually agreed terms, Scheduled Tribes or other forest dwellers shall not be resettled, or have their rights adversely affected, to create inviolate areas, unless conditions in section 38V(5) are met. These include the informed consent of the Gram Sabha and of the persons affected.





Sources: Day 18 Source Index | Topic 175 | 2.3

Day 18 | T175 · P05 | 68/155

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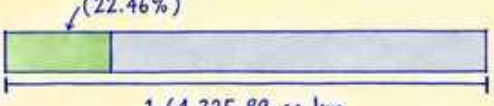
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Forest area denominators

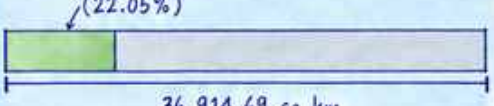


India, for comparison: 574 wildlife sanctuaries covering 1,27,241.24 sq km (MoEFCC data, as on February 2025).

Notified forest as a share of the total geographical area



Forest under the protected area network as a share of the notified forest



Andhra Pradesh Forest Department	
Notified forest covers	36,914.69 sq km
Percentage of the geographical area	22.46 per cent
Geographical area denominator	1,64,325.89 sq km
Forest under the protected area network	8,139.89 sq km
Percentage of the notified forest	22.05 per cent



Notified forest is not forest cover. Notified forest is the area recorded as forest by notification, Forest cover is a different measure, reported by the India State of Forest Report; that report is Topic 716 (Day 72).

Calculating the percentages:

36,914.69 ÷ 1,64,325.89 × 100 ≈ 22.46%.
8,139.89 ÷ 36,914.69 × 100 ≈ 22.05%.



Sources: Day 18 Source Index | Topic 175 | 2.4

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Nagarjunsagar-Srisailam



Name	Type	Location	Area	Known for
Nagarjunasagar-Srisailam Tiger Reserve	Tiger reserve	Andhra Pradesh	Core 2,595.72 sq km + buffer 700.59 sq km = 3,296.31 sq km (NTCA)	The largest total area, and the largest core area, in the NTCA table of 58 tiger reserves (15 October 2026)

Tiger reserve: Nagarjunsagar Srisailam.
The Amrabad Tiger Reserve (2,611.39 sq km) in the same NTCA list belongs to Telangana, not to Andhra Pradesh.

Nagarjuna Sagar-Srisailam

Protected area	Location	Area	Known for
Nagarjuna Sagar-Srisailam	Andhra Pradesh	2,131.31	The sanctuary that shares its name with the tiger reserve



Protected area	Designation and area	Distinct designation	How to read it
Nagarjunasagar-Srisailam	Tiger reserve: 3,296.31 sq km (NTCA)	Sanctuary: 2,131.31 sq km (MoEFCC)	A tiger reserve includes core and buffer areas under section 38V. A sanctuary is a separate legal designation under the Wild Life (Protection) Act. The tiger-reserve and sanctuary boundaries are separate.



2. Mixing up two areas and two States.
The Nagarjunasagar-Srisailam Tiger Reserve covers 3,296.31 sq km in the NTCA list, but the sanctuary of the same name is a separate notification of 2,131.31 sq km. The Amrabad Tiger Reserve is in Telangana, not Andhra Pradesh.



Sources: Day 18 Source Index | Topic 175 | 2.5; 2.6; 3; 4

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Three national parks

Sri Venkateswara National Park

Type: National park
Where: Tirupati district; the Seshachalam Hills of the Eastern Ghats, including the Tirumala Hills
Area: 353.63 sq km (gazette area)

Known for: Red sanders and other endemic plants; the Indian golden gecko; the slender loris. Established as a national park in September 1989.



Papikonda National Park

Type: National park
Where: The Papi hills, through which the Godavari cuts a gorge below Kunavaram (Topic 45)
Area: 1,012.86 sq km
Earlier designation: Papikonda Wildlife Sanctuary.



Rajiv Gandhi (Rameswaram) National Park

Type: National park
Where: Andhra Pradesh
Area: 2.5 sq km
Known for: The smallest of the three national parks.



Name	Type	Location	Area	Known for
Sri Venkateswara National Park	National park	Tirupati district; the Seshachalam Hills of the Eastern Ghats, including the Tirumala Hills	353.63 sq km (gazette area)	Red sanders and other endemic plants; the Indian golden gecko; the slender loris. Established as a national park in September 1989
Papikonda National Park	National park	The Papi hills, through which the Godavari cuts a gorge below Kunavaram (Topic 45)	1,012.86 sq km	**Earlier designation:** Papikonda Wildlife Sanctuary.
Rajiv Gandhi (Rameswaram) National Park	National park	Andhra Pradesh	2.5 sq km	The smallest of the three national parks.

The State's elephant reserve and its biosphere reserve (Seshachalam) are taught with the reserves of India on Day 50 (Topic 495).

Protected area	Designation and area	Distinct designation	How to read it
Sri Venkateswara	National park: 353.63 sq km in the MoEFCC gazette	Sanctuary of the same name: 172.35 sq km (MoEFCC)	Keep the park and sanctuary designations separate. The figure 525.97 sq km refers to the wider sanctuary extent in older official descriptions; it is not an alternative area for the national park.

Sources: Day 18 Source Index | Topic 175 | 2.5; 3

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Mangroves and lake birds













Important mangrove and wetland sanctuaries

Areas are those of the MoEFCC data (as on February 2025) unless stated.

Sanctuary	Location	Area (sq km)	Known for
Coringa	Kakinada district, on the deltaic branches of the Godavari and the Gautami; before the 2022 district reorganisation, this area was in East Godavari district.	235.7	Tidal mangrove forest where the Godavari meets the backwaters of the Bay of Bengal; its sea coast is a breeding ground for olive ridley sea turtles; the fishing cat and the smooth-coated otter. Notified in 1978
Kolleru	Andhra Pradesh	308.55	A wetland bird sanctuary; Kolleru Lake was designated a Ramsar site on 19 August 2002
Pulicat Lake	Andhra Pradesh	600	A lake bird sanctuary

Sources: Day 18 Source Index | Topic 175 | 2.6

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Grassland and scrub specialists

Areas are those of the MoEFCC data (as on February 2025) unless stated.



Sanctuary	Location	Area (sq km)	Known for
Rollapadu	Nandyal district, about 40 km from Nandyal	6.14	The Great Indian Bustard, and the Lesser Florican; mainly grassland on an undulating plain. Notified in 1988
Sri Lankamalleswara	Kadapa district (officially YSR Kadapa)	464.43	Jerdon's Courser, described by Thomas C. Jerdon in 1848, thought to be extinct, and rediscovered in 1986; dry deciduous mixed thorn forest with deep gorges



Sources: Day 18 Source Index | Topic 175 | 2.6

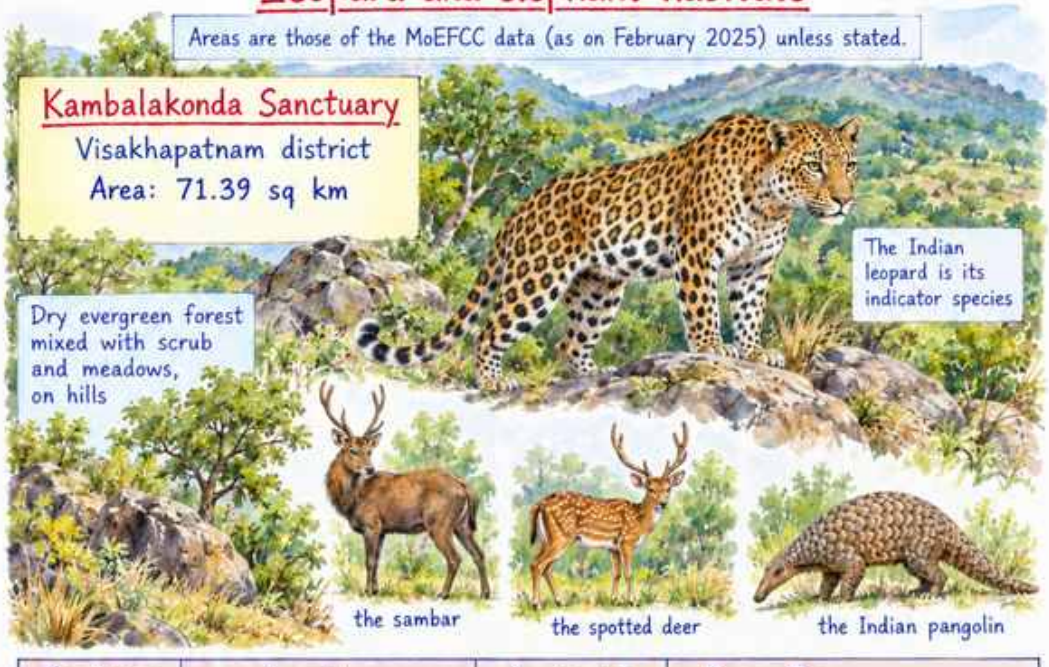
Day 18 | T175 · P10 | 73/155

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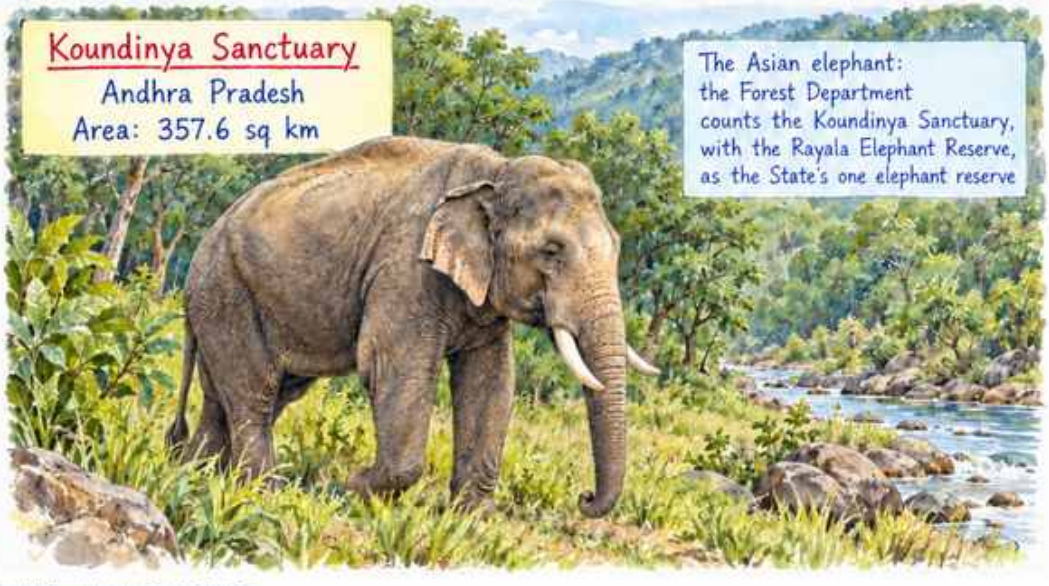
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Leopard and elephant habitats

Areas are those of the MoEFCC data (as on February 2025) unless stated.



Sanctuary	Location	Area (sq km)	Known for
Kambalakonda	Visakhapatnam district	71.39	Dry evergreen forest mixed with scrub and meadows, on hills; the Indian leopard is its indicator species; also the sambar, the spotted deer and the Indian pangolin
Koundinya	Andhra Pradesh	357.6	The Asian elephant: the Forest Department counts the Koundinya Sanctuary, with the Rayala Elephant Reserve, as the State's one elephant reserve



Sources: Day 18 Source Index | Topic 175 | 2.6

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All 13 sanctuary inventory

Areas are those of the MoEFCC data (as on February 2025) unless stated.

1. Coringa
235.7 sq km



2. Kolleru
308.55 sq km



3. Pulicat Lake
600 sq km



4. Rollapadu
6.14 sq km



5. Sri Lankamalleswara
464.43 sq km



6. Kambalakonda
71.39 sq km



7. Koundinya
357.6 sq km



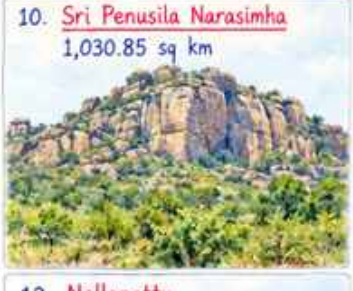
8. Nagarjuna Sagar-Srisailam
2,131.31 sq km



9. Gundla Brahmeswaram
1,193.68 sq km



10. Sri Penusila Narasimha
1,030.85 sq km



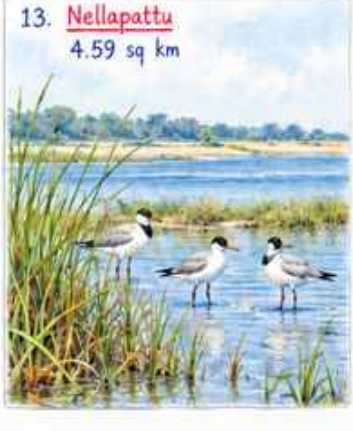
11. Krishna
194.81 sq km



12. Sri Venkateswara
172.35 sq km



13. Nellapattu
4.59 sq km



Sanctuary inventory (MoEFCC, as on February 2025; area in sq km):

1	Coringa	235.7
2	Kolleru	308.55
3	Pulicat Lake	600
4	Rollapadu	6.14
5	Sri Lankamalleswara	464.43
6	Kambalakonda	71.39
7	Koundinya	357.6
8	Nagarjuna Sagar-Srisailam	2,131.31
9	Gundla Brahmeswaram	1,193.68
10	Sri Penusila Narasimha	1,030.85
11	Krishna	194.81
12	Sri Venkateswara	172.35
13	Nellapattu	4.59

13 sanctuaries: the displayed rounded areas total 6,771.40 sq km.

The other five sanctuaries in the MoEFCC list: Gundla Brahmeswaram (1,193.68 sq km), Sri Penusila Narasimha (1,030.85 sq km), Krishna (194.81 sq km), Sri Venkateswara (172.35 sq km) and Nellapattu (4.59 sq km). That makes 13.

Two places named Sri Venkateswara: the Sri Venkateswara National Park and the Sri Venkateswara Wildlife Sanctuary are separate protected areas, in separate lists.

Sources: Day 18 Source Index | Topic 175 | 2.6

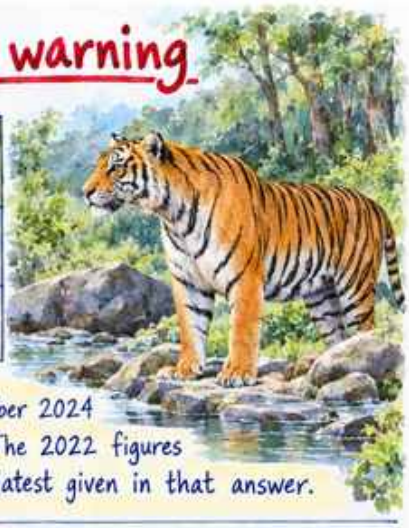
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Tiger census with boundary warning

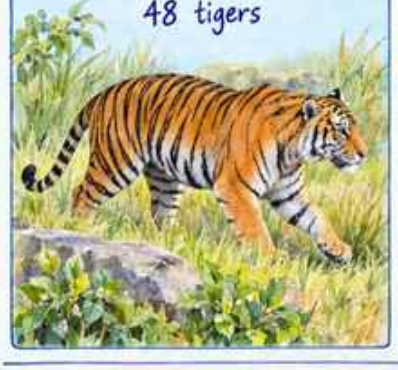
All India Tiger Estimation	2006	2010	2014	2018	2022
Andhra Pradesh	95	72	68	48	63
India	1,411	1,706	2,226	2,967	3,682



These figures are from the Lok Sabha answer of 2 December 2024 (Ministry of Environment, Forest and Climate Change). The 2022 figures are the fifth cycle of the estimation, and they are the latest given in that answer.

2018: 48

Andhra Pradesh
48 tigers

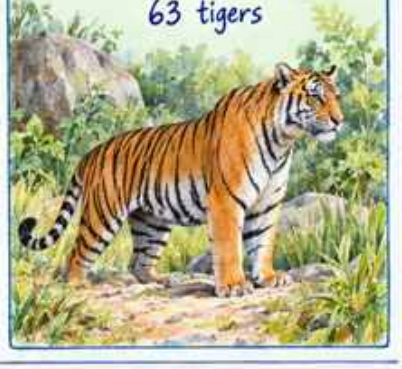


2018 to 2022: Andhra Pradesh rose from 48 to 63 tigers, an increase of 15.

increase of 15

2022: 63

Andhra Pradesh
63 tigers



The State was reorganised in 2014 (Topic 14). The 2006, 2010 and 2014 figures are for the undivided State: the NTCA's 2018 tiger status report has no Telangana figure before 2018, and combines the 2018 Andhra Pradesh and Telangana figures to compare with the earlier figures.



Sources: Day 18 Source Index | Topic 175 | 2.7

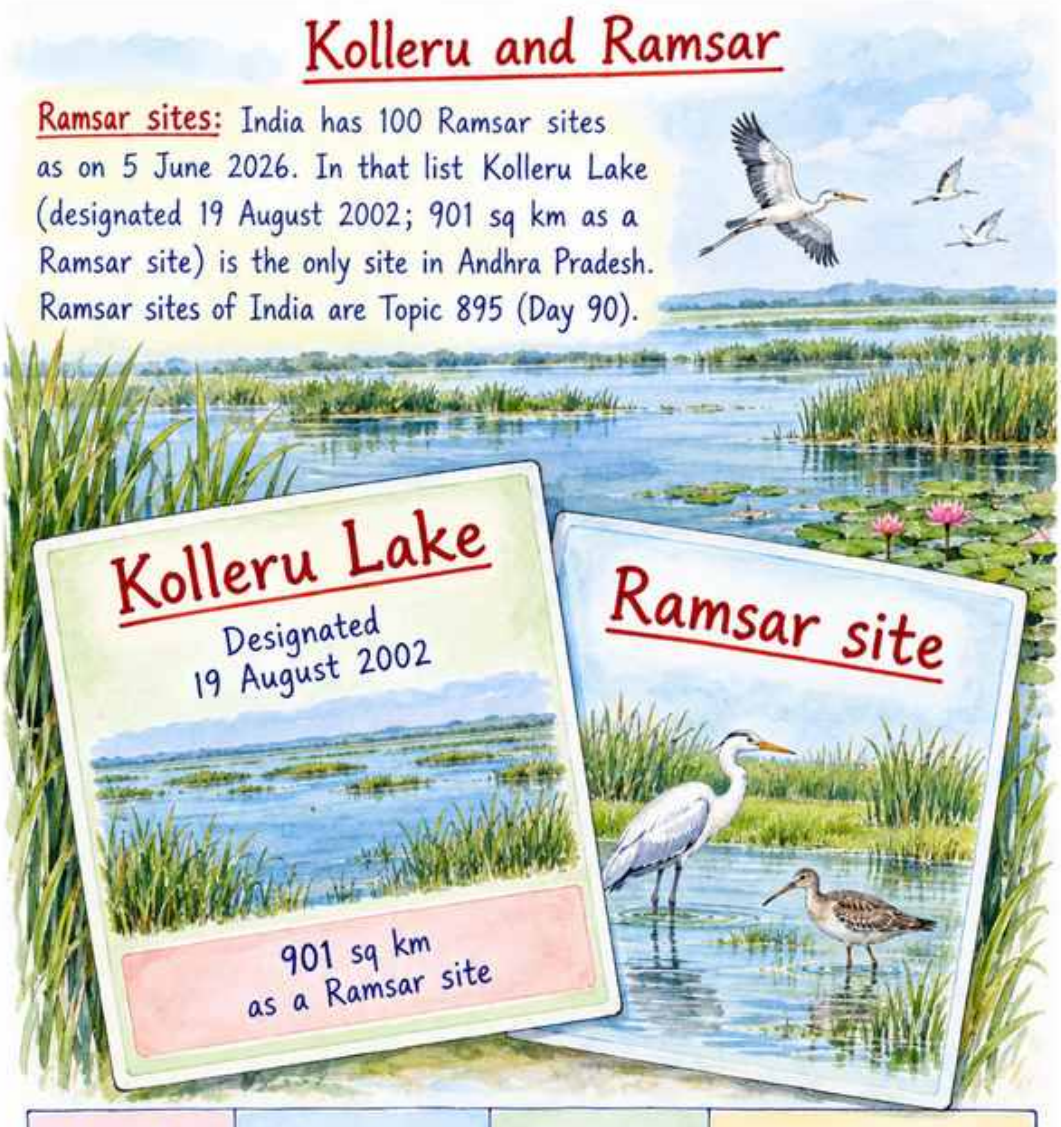
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Kolleru and Ramsar

Ramsar sites: India has 100 Ramsar sites as on 5 June 2026. In that list Kolleru Lake (designated 19 August 2002; 901 sq km as a Ramsar site) is the only site in Andhra Pradesh. Ramsar sites of India are Topic 895 (Day 90).



Protected area	First figure	Second figure	How to read it
Kolleru	Sanctuary: 308.55 sq km (MoEFCC)	Ramsar site: 901 sq km	The sanctuary and the Ramsar site are two different designations, each with its own figure

Sources: Day 18 Source Index | Topic 175 | 2.7; 3

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Same name, different designation

1. Nagarjunasagar-Srisailam

Tiger reserve: 3,296.31 sq km (NTCA)

Sanctuary: 2,131.31 sq km (MoEFCC).

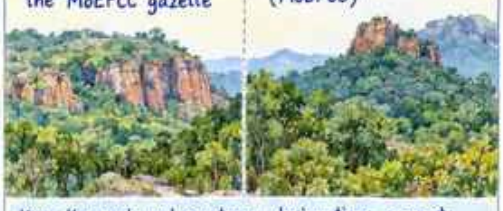


A tiger reserve includes core and buffer areas under section 38V. A sanctuary is a separate legal designation under the Wild Life (Protection) Act.

2. Sri Venkateswara

National park: 353.63 sq km in the MoEFCC gazette

Sanctuary of the same name: 172.35 sq km (MoEFCC)



Keep the park and sanctuary designations separate. The figure 525.97 sq km refers to the wider sanctuary extent in older official descriptions; it is not an alternative area for the national park.

3. Kolleru

Sanctuary: 308.55 sq km (MoEFCC)

Ramsar site: 901 sq km



The sanctuary and the Ramsar site are two different designations, each with its own figure.

4. Pulicat Lake

Sanctuary: 600 sq km (MoEFCC)

Area depends on the notified boundary.



Match the notified boundary and reporting date.

5. Kambalakonda

Sanctuary: 71.39 sq km (MoEFCC)

Area depends on the notified boundary.



Match the notified boundary and reporting date.

6. Count of sanctuaries

13 (Andhra Pradesh Forest Department)

13 (MoEFCC, as on February 2025)



Dated count: February 2025

Rules of thumb

1. Area follows designation and boundary: a tiger reserve, wildlife sanctuary, national park and Ramsar site can share a name but have different extents. Counts and areas need a reporting date.



2. Every figure has a date. A count of tiger reserves (58 on 15 October 2026) or of Ramsar sites (100 on 5 June 2026) can rise before the examination.



Sources: Day 18 Source Index | Topic 175 | 3

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Protected-area exam traps

1 "Grazing is banned in both kinds of protected area." It is not.

The Act bars the grazing of any livestock in a national park. In a sanctuary, the Chief Wild Life Warden may regulate, control or prohibit it.

A national park is the stricter of the two, and removal of wildlife or forest produce is subject to the restricted permit exception in section 35(6).

The Chief Wild Life Warden's permit requires State Government authorisation after consultation with the National Board, for improvement and better management of wildlife.



Removal of wildlife or forest produce is subject to the restricted permit exception in section 35(6).

The Chief Wild Life Warden's permit requires State Government authorisation after consultation with the National Board, for improvement and better management of wildlife.

2 Mixing up two areas and two States.

The Nagarjunasagar-Srisailam Tiger Reserve covers 3,296.31 sq km in the NTCA list, but the sanctuary of the same name is a separate notification of 2,131.31 sq km.

The Amrabad Tiger Reserve is in Telangana, not Andhra Pradesh.



3 Taking one name for one place.

Sri Venkateswara is the name of a national park and also of a separate wildlife sanctuary.
Papikonda was formerly a wildlife sanctuary and is now one of the State's three national parks.
The State has 3 national parks and 13 wildlife sanctuaries; do not count the sanctuary of Sri Venkateswara as a fourth park.



Sources: Day 18 Source Index | Topic 175 | 4

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AP ports: size is not the legal test



Major and non-major are legal categories—not simply measures of size.

MAJOR PORTS



Declared by the Central Government through a Gazette notification.



Union jurisdiction; Visakhapatnam is Andhra Pradesh's major port.

PORTS OTHER THAN MAJOR PORTS



State jurisdiction; Andhra Pradesh Maritime Board oversees the State port framework.



A large private port can still be legally non-major.

National Context



Ministry Ports Wing: 14 major ports, 12 operational; about 200 non-major ports, around 65 handling cargo.



Classification ≠ cargo rank ≠ ownership

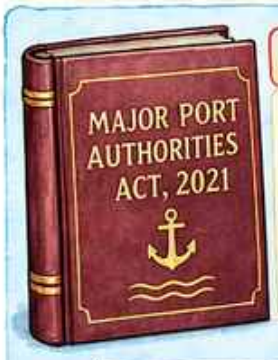


Source: Ministry of Ports, Shipping and Waterways; Indian Ports Act, 2025, section 2(1)(m). | Day 19 | Topic 186 | 1/8 | iaswithdrravi.com

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Two Acts: different jobs



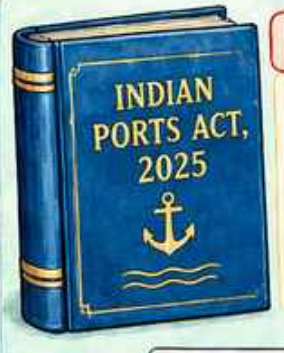
Major Port Authorities Act, 2021

- In force: 3 November 2021.
- Replaced the Major Port Trusts Act, 1963.
- Boards of Major Port Authorities manage the major-port framework.

Boards of Major Port Authorities



Major ports
(managed under the 2021 Act)



Indian Ports Act, 2025

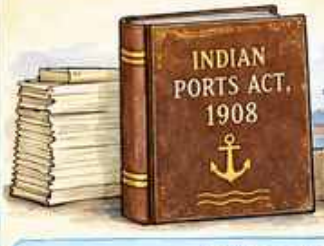
- Assent: 21 August 2025.
- In force: 1 April 2026.
- Section 15(1): State Maritime Boards are responsible for ports other than major ports.

State Maritime Boards

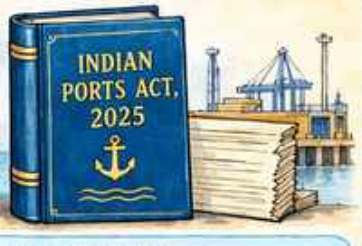


Ports other than major ports
(under State Maritime Boards)

From 1908 to 2025



Section 85: repeal and savings



Earlier rules and notifications may continue through the savings provision; repeal does not erase every past action.

Section 3: Maritime State Development Council

Chaired by the Union Minister for Ports, Shipping and Waterways.



Takeaway



Source: Indian Ports Act, 2025; S.O.1499(E), 23 March 2026; Ministry Ports Wing.

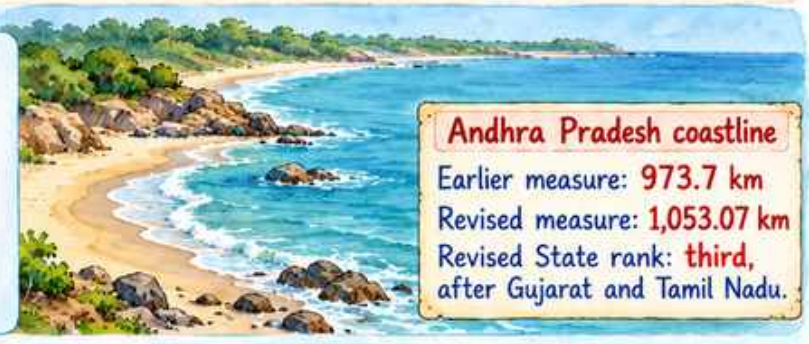
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A longer measured coast—not new land

What is the issue?

The length of the Andhra Pradesh coastline has been revised because modern, high-resolution data measure a more detailed and accurate shoreline. This does not mean any new land has been added; it only reflects a more precise measurement of the existing, naturally irregular coast.



Andhra Pradesh coastline
Earlier measure: 973.7 km
Revised measure: 1,053.07 km
Revised State rank: third, after Gujarat and Tamil Nadu.

Why the length increased

A natural coastline is not a straight line. It has many small curves, bends and inlets. When we measure with longer, coarse segments, these details are smoothed out. High-resolution data and modern GIS use much finer segments, which follow the actual shape of the shoreline more closely, resulting in a longer measured length.

Coarse measurement (earlier)



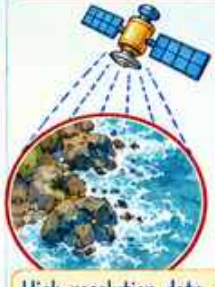
Longer, coarse segments miss many small curves, so the measured length is shorter.

Finer measurement (revised)



Shorter, finer segments follow the actual coastline more closely, so the measured length is longer.

Measurement lens



High-resolution data + modern GIS capture more detail.

Key dates



29 April 2025: revised length promulgated.



4 December 2025: Ministry of Earth Sciences parliamentary reply.

Why it matters

Port planning



A more accurate coastline length helps in better planning of ports and related activities.

Disaster-risk assessment



Detailed coastline data supports improved cyclone warning, risk assessment and preparedness.

Coastal infrastructure



Helps in planning and designing coastal infrastructure such as roads, sea walls and other facilities.

Important distinction



The revised coastline measurement does not change Coastal Regulation Zone jurisdiction.
CRZ boundaries depend on the actual High Tide Line.

Source: PIB, Ministry of Earth Sciences, 4 December 2025, release2198800.

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Visakhapatnam: railway harbour to port authority

1927–1933

Bengal Nagpur Railway built the Inner Harbour for manganese-ore traffic from the Central Provinces.



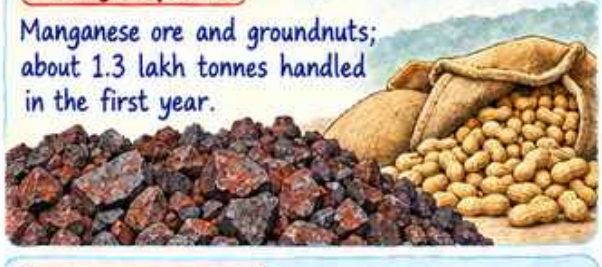
7 October 1933

Opened to ocean traffic with S.S. Jaladurga.



Early exports

Manganese ore and groundnuts; about 1.3 lakh tonnes handled in the first year.



February 1964

Transferred to a Port Trust.



Harbour engineering

Dredging formed the harbour; two old ships were scuttled to form the Island Breakwater.



19 December 1933

Formal inauguration by Lord Willingdon.



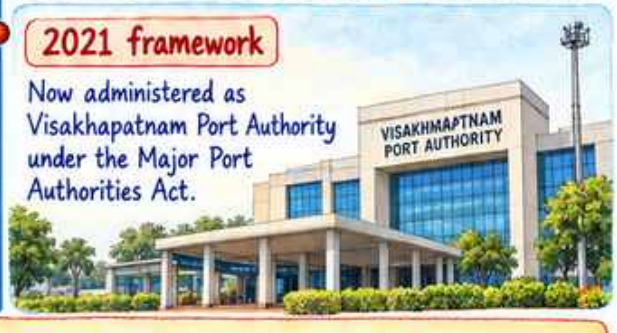
1961–1971

Captive iron-ore berths and an ore-handling plant expanded cargo capability.



2021 framework

Now administered as Visakhapatnam Port Authority under the Major Port Authorities Act.





Opening to traffic ≠ formal inauguration.

Source: Visakhapatnam Port Authority, Our History. | Day19 | Topic186 | 4/8 | iaswithdrravi.com

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Cargo: always read the year and denominator

April–March 2025-26: ADVANCE ESTIMATES

Top five major ports by cargo handled (in million metric tonnes – MMT).

1. Deendayal: 160.11 MMT



2. Paradip: 156.45 MMT



3. Jawaharlal Nehru: 102.01 MMT



4. Visakhapatnam: 91.17 MMT



5. Mumbai: 75.15 MMT



12 reporting major ports: 914.73 MMT



Visakhapatnam Port – Key Numbers

2024-25 provisional:	82623000 tonnes
2025-26 advance estimate:	91166346 tonnes
Growth:	10.34%
Share of all major-port cargo:	9.97%



Port cross-section: waterline, keel and draft

Inner harbour, outer harbour and fishing harbour serve different functions. Navigable draft can change after dredging; old dimensions are not timeless limits.



9.97% is not AP's share of all Indian-port cargo.

Source: Ministry, Cargo handling status for major ports, March2026, pp.1,3,6; VPA OurHistory. | Day19 | Topic 186 | 5/8 | iaswithdrravi.com

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Five State ports + Visakhapatnam: two counting bases

Gangavaram

Deep-water cargo port; legally non-major.



Krishnapatnam

Deep-water cargo port; legally non-major.



Kakinada Deep Water Port

Commissioned in November 1997. Kakinada Seaports took over operations in 1999.



Kakinada Anchorage Port

Anchorage-based cargo operations: small craft transfer cargo between shore and anchored ships.



Ravva

Captive port supporting offshore facilities in the Krishna-Godavari Basin.



Two counting bases for ports in Andhra Pradesh

5 operational State ports



Gangavaram | Krishnapatnam | Kakinada Deep Water Port | Kakinada Anchorage Port | Ravva

\+

1 Union major port



Visakhapatnam

= **6 operational ports**

The five-port list is the Maritime Board's stated inventory; six includes Visakhapatnam.



Notified ≠ operational.
A port count needs its date and counting basis.



Source: Andhra Pradesh Maritime Board, greenfield-ports note; Kakinada Seaports, About Us.

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Four greenfield projects: learn the development model

Greenfield = a port developed on a new site.

Mulapeta

State-developed project in northern Andhra Pradesh.



Machilipatnam

State-developed project in central Andhra Pradesh.



Ramayapatnam

State-developed project in southern Andhra Pradesh.



Kakinada Gateway / Kakinada SEZ Port

Public–private partnership model.



Development model: from port to growth



The bigger idea

The Maritime Board envisages ports as industrial complexes—not only berths.



Key distinction

Proposed capacity, construction progress and operational cargo are three different measures.

This is a project-model overview, not a claim that construction is complete.

Source: Andhra Pradesh Maritime Board, Securing High Hopes on 4 Greenfield Ports. | Day19 | Topic186 | 7/8 | iaswithdrravi.com

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A port economy is larger than the quay



Cargo ports and the economy

Cargo ports link hinterland producers with domestic and overseas markets.

Fishing harbours have a different role

Fishing harbours support landing, handling and distribution of fish; they are not interchangeable with cargo-port capacity.



AP Maritime Policy 2024-29



Target: **20%** of total cargo handled by all Indian ports by 2047.



TARGET — not an achieved share.

AP NON-MAJOR ports, 2025-26 Advance Estimates

- Cargo: **116765871** tonnes
- Share of India's non-major-port cargo: **15.51%**
- Growth over 2024-25: **11.93%**

Different denominators — compare correctly

Policy target: ALL Indian ports
20% of total cargo handled by all Indian ports by 2047.

15.51% statistic: NON-MAJOR Indian ports only
Share of India's non-major-port cargo in 2025-26.

Revision cue for any port statistic



→ Is it cargo or fishing?
→ Which year or period?
→ Tonnes or percentage?
→ All ports or non-major ports only?
→ Target or achieved figure?

Source: AP Maritime Policy 2024; Ministry non-major-port cargo report, March 2026, Table 1. Day 19 | Topic 186 | 8/8 | iaswithdrravi.com

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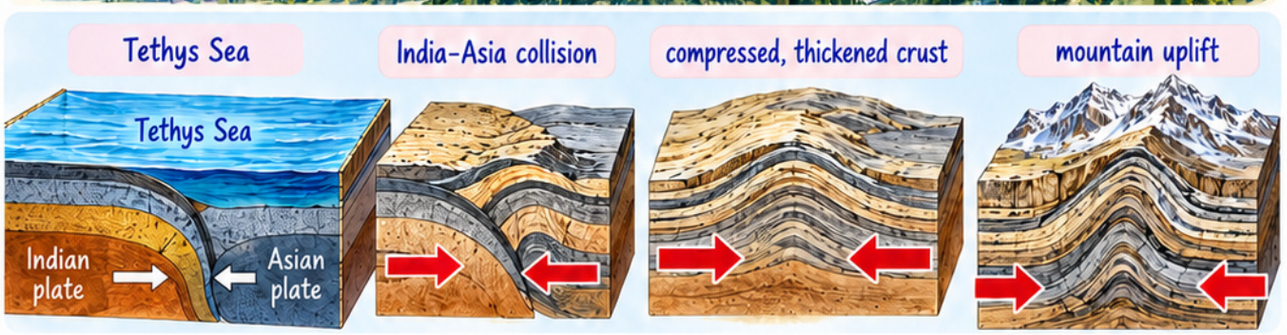
Himalayas: the making of young fold mountains

Day 20 | Topic 194 | Geography | Unit D-2 | 1/9

2.1 Formation and geological character

The Himalayas are geologically young fold mountains. The Indian plate continues to move north.





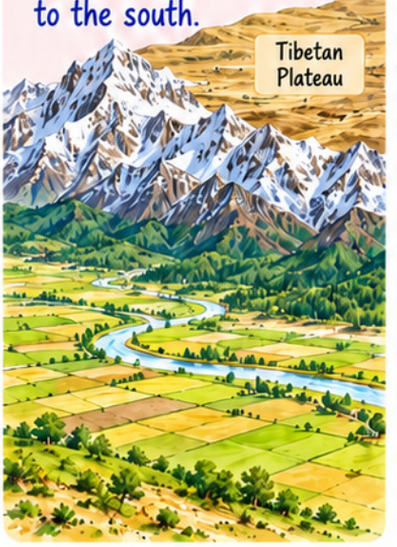
USGS: collision began about 40–50 million years ago. Its introductory account describes continuing uplift of more than 1 cm a year.

NCERT XI contrasts the young, weak and flexible Himalayas with the rigid, stable Peninsular Block.

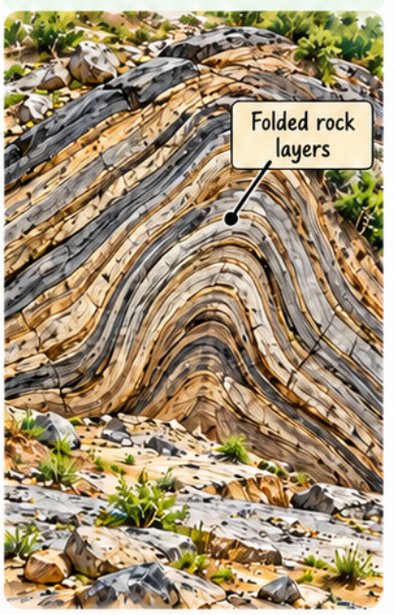
Fast rivers cut youthful landforms: deep gorges, V-shaped valleys, rapids and waterfalls.



The mountain barrier stands between the Tibetan Plateau and the alluvial plains to the south.



Recall Topic 136:
Himadri • Himachal • Shiwalik.



Concept illustrations; institutional buildings are schematic.

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DAY 20 | TOPIC 194 | Unit D-2 | 2/9

Himalayas: extent, direction and three parallel ranges

Day 20 | Topic 194 | Geography | Unit D-2 | 2/9

2.2 Extent: keep each source with its figure

NCERT IX: about 2,400 km, Indus to Brahmaputra. Width: about 400 km in Kashmir, narrowing to 150 km in Arunachal Pradesh.

NCERT XI: about 2,500 km east-west; 160–400 km north-south.

USGS: about 2,900 km. Do not mix the measures.

Directions:

NW–SE in north-western India



E–W in Darjiling-Sikkim



SW–NE in the older NCERT Arunachal regional account



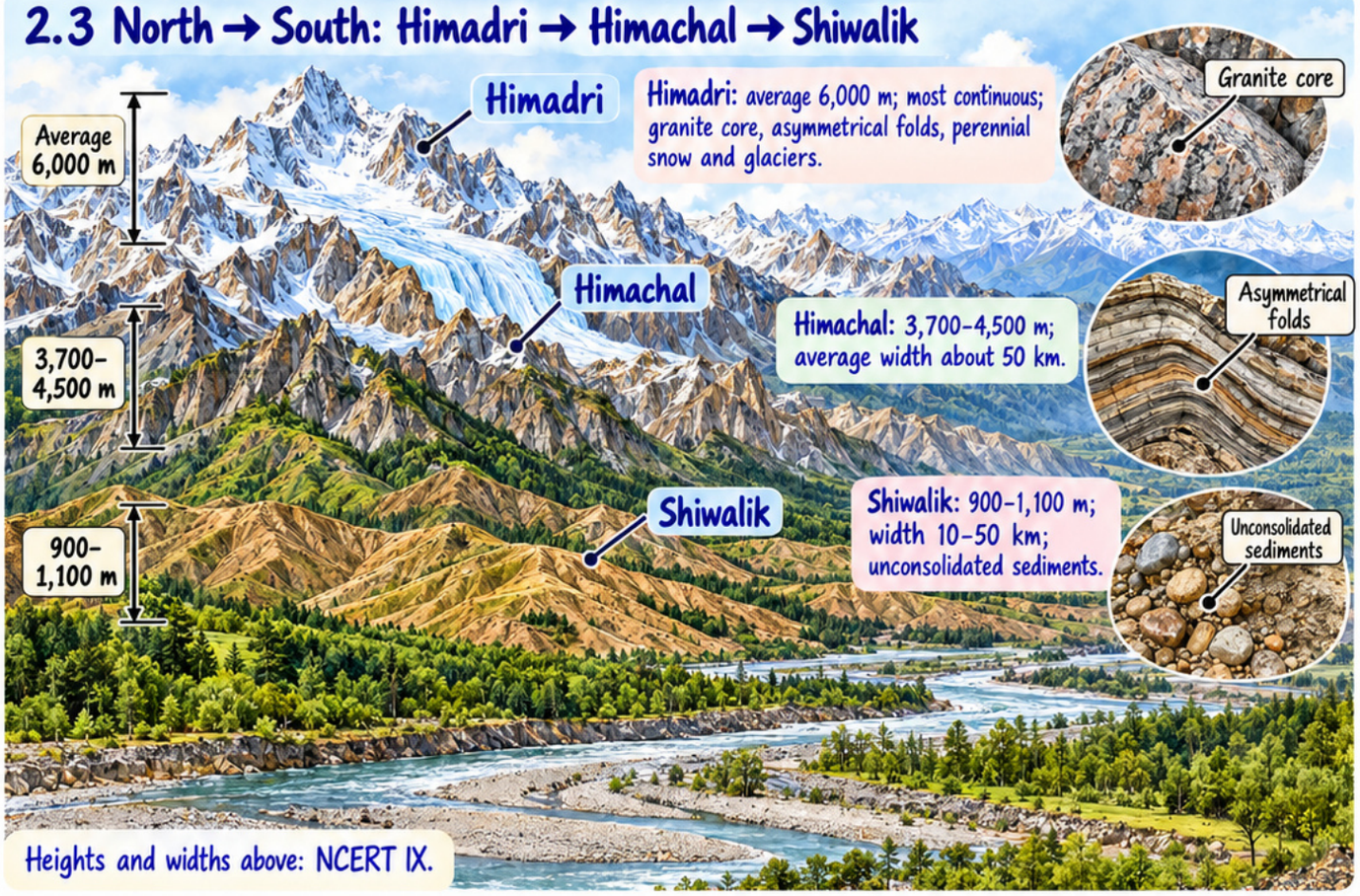
N–S in Nagaland, Manipur and Mizoram



Beyond the Dihang gorge, the ranges bend sharply south.



2.3 North → South: Himadri → Himachal → Shiwalik



Heights and widths above: NCERT IX.

Concept illustrations; institutional buildings are schematic.

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Himalayas: valleys, duns and the northern ranges

Day 20 | Topic 194 | Geography | Unit D-2 | 3/9

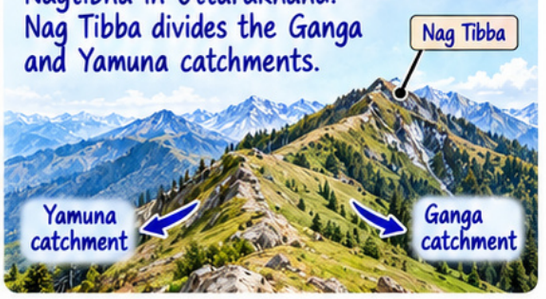
Pir Panjal and related ranges

Pir Panjal is the longest and most important Lesser Himalayan range. Dhaula Dhar and Mahabharat are also prominent.



Local names in NCERT XI

Dhauladhar in Himachal Pradesh; Nagtibha in Uttarakhand. Nag Tibba divides the Ganga and Yamuna catchments.



Kangra and Kullu valleys

Kangra and Kullu are Lesser Himalayan valleys.



Kashmir Valley

Kashmir Valley lies between the Great Himalayas and Pir Panjal.



Hill stations in the Lesser Himalayas



Duns: location and examples

Duns are longitudinal valleys between Himachal and Shiwalik—not between Himadri and Himachal.



Examples from NCERT

NCERT IX: Dehra Dun, Kotli Dun, Patli Dun.

Older NCERT XI: Jammu, Pathankot, Chandigarh–Kalka, Nalagarh, Dehra, Harike and Kota duns.

Dehra Dun: size (older NCERT XI)

Dehra Dun: about 35–45 km long and 22–25 km wide in older NCERT XI.



Far-northern ranges

Far-northern ranges: Karakoram—K2; Ladakh—Khardung La; Zaskar—Photu La. Pir Panjal belongs to Himachal.



Watershed divide at a mountain ridge



Concept illustrations; institutional buildings are schematic.

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Himalayas: two regional schemes, not one

Day 20 | Topic 194 | Geography | Unit D-2 | 4/9

2.4 NCERT IX: divisions bounded by rivers, west → east



Punjab Himalaya is also known regionally as Kashmir and Himachal Himalaya.

Older NCERT XI: five regional divisions

1	2	3	4	5
Kashmir / North-western	Himachal and Uttarakhand	Darjiling and Sikkim	Arunachal	Eastern Hills and Mountains

Kashmir: Karakoram, Ladakh, Zaskar, Pir Panjal; a cold desert in the north-east; Baltoro and Siachen glaciers.



Karewas are thick deposits of glacial clay used for zafran (saffron).



Jhelum meanders in Kashmir Valley.



Fresh-water lakes: Dal, Wular.
Saline lakes in the textbook list: Pangong Tso, Tso Moriri.



Remember:
NCERT IX Kumaon begins at **Satluj**; older NCERT XI Himachal-Uttarakhand begins at **Ravi**. Both end at Kali.

Concept illustrations; institutional buildings are schematic.

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DAY 20 | TOPIC 194 | Unit D-2 | 5/9

Himalayas: regional landscapes from Ravi to the east

Day 20 | Topic 194 | Geography | Unit D-2 | 5/9

2.4 Older NCERT XI regional features

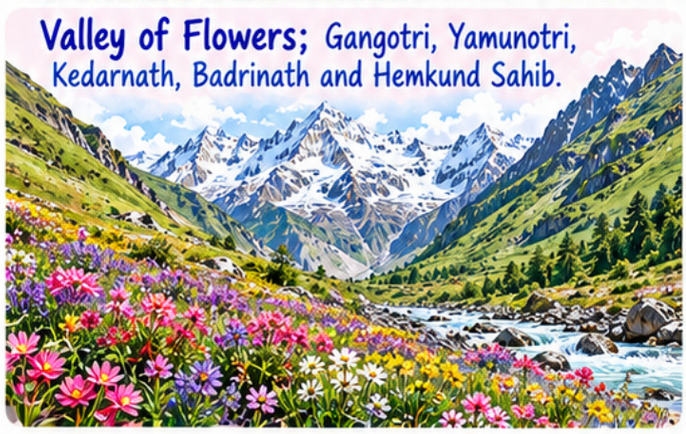
Himachal–Uttarakhand: Ravi to Kali. Indus system: Ravi, Beas, Satluj. Ganga system: Yamuna, Ghaghara.



Hill stations: Dharamshala, Mussoorie, Shimla, Kaosani; Kasauli, Almora, Lansdowne, Ranikhet. Bhotias move to the Bugyals—summer pastures.



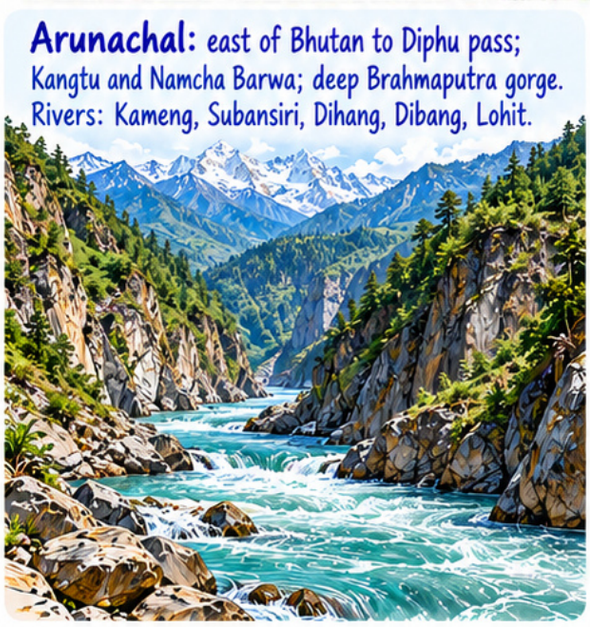
Valley of Flowers; Gangotri, Yamunotri, Kedarnath, Badrinath and Hemkund Sahib.



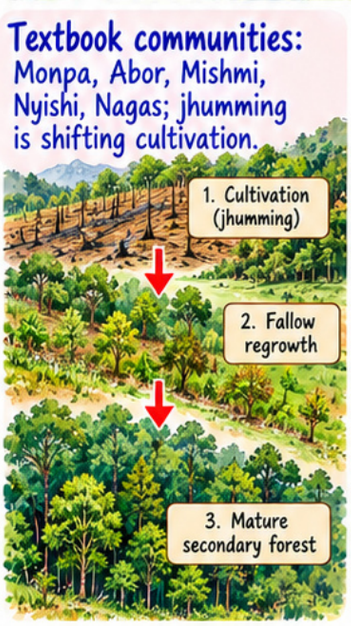
Darjiling–Sikkim: between Nepal and Bhutan Himalayas; Kanchenjunga and Tista. Duars replace Shiwaliks in this textbook account; tea gardens; Lepchas in higher reaches.



Arunachal: east of Bhutan to Diphu pass; Kangtu and Namcha Barwa; deep Brahmaputra gorge. Rivers: Kameng, Subansiri, Dihang, Dibang, Lohit.



Textbook communities: Monpa, Abor, Mishmi, Nyishi, Nagas; jhumming is shifting cultivation.



Eastern Hills: Patkai Bum, Naga and Manipur hills; Mizo/ Lushai hills farther south. Barak river; Loktak lake in Manipur.



Concept illustrations; institutional buildings are schematic.

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DAY 20 | TOPIC 194 | Unit D-2 | 6/9

Himalayas: peaks and source-specific heights

Day 20 | Topic 194 | Geography | Unit D-2 | 6/9

2.5 Do not confuse a textbook figure with a newer measurement

Everest

8,848 m in NCERT; 8,848.86 m announced in 2020 (Topic 116).



K2

8,611 m, Karakoram; second highest in the world. K2 is absent from the NCERT IX peak table.



Kanchenjunga

8,598 m in NCERT; 8,586 m in Britannica (Topic 136); on the Sikkim–Nepal border.



Nanda Devi

7,817 m in the NCERT IX peak list.



NCERT IX: first three below; Kangto: Britannica

Nanga Parbat

8,126 m



Kamet

7,756 m



Namcha Barwa

7,756 m



Kangto

7,090 m in Britannica; older NCERT XI spells it Kangtu.



Location caution

NCERT lists Namcha Barwa under India, but the peak lies in Tibet (China). Read the source label.



NASA Earth Observatory

all 14 peaks higher than 8,000 m lie in the Himalaya or Karakoram.



Exam trap

Kanchenjunga is not the world's second-highest peak— K2 is.



Heights retain their cited source and date.

Concept illustrations; institutional buildings are schematic.

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APPSC GROUP 1 | 1,000 TOPICS IN 100 DAYS
DAY 20 | TOPIC 194 | Unit D-2 | 7/9

Himalayan passes: western routes and their ranges

Day 20 | Topic 194 | Geography | Unit D-2 | 7/9

3 Important passes: name → range / region → link

Zoji La

Great Himalayas; J&K–Ladakh border region; Kashmir Valley ↔ Ladakh.



Banihal

Jammu and Kashmir; crosses the Pir Panjal range.



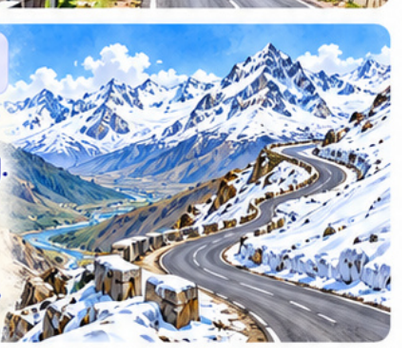
Photu La

Ladakh; Zaskar range; on the Srinagar–Leh highway, between Staktse and Lamayuru.



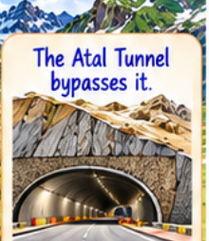
Khardung La

Ladakh range; Leh ↔ Nubra valley. The Leh district site calls it a gateway to Shyok and Nubra.



Rohtang

Himachal Pradesh; Manali ↔ Lahaul. The Atal Tunnel bypasses it.



Baralacha La

Himachal Pradesh near Ladakh; on the Manali–Leh highway.



Shipki La

Kinnaur, Himachal Pradesh ↔ Tibet. Official Kinnaur district account confirms the old Hindustan–Tibet road crosses here. Satluj enters near the pass.

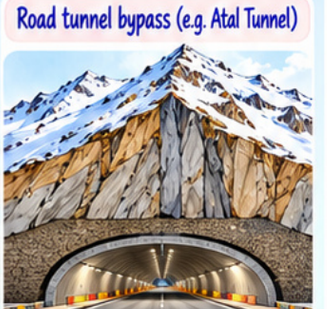


Icy high pass vs road tunnel bypass

Icy high pass (e.g. Zoji La)



Road tunnel bypass (e.g. Atal Tunnel)



MCQ anchor: Lipulekh–Pithoragarh; Shipki La–Kinnaur; Khardung La–Leh/Nubra; Zoji La–Kashmir/Ladakh.

Concept illustrations; institutional buildings are schematic.

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DAY 20 | TOPIC 194 | Unit D-2 | 8/9

Himalayan passes: trade and pilgrimage gateways

Day 20 | Topic 194 | Geography | Unit D-2 | 8/9

3 Passes farther east

Lipulekh: Pithoragarh district, Uttarakhand ↔ Tibet, near Purang (Taklakot). A Kailash Mansarovar Yatra route.



Mana: Uttarakhand, north of Badrinath; an old trade route toward Tibet. Historic trade linked Badrinath with western Tibet.



Nathu La: Sikkim ↔ Tibet; reopened on 6 July 2006 after closure following the 1962 war.



Jelep La: Sikkim ↔ Chumbi Valley, Tibet; old Lhasa–India trade route with Kalimpong as a contact point.



Bomdi La / Bomdila: Arunachal Pradesh, on the Assam–Tawang approach.



Se La: Dirang ↔ Tawang. The Sela Tunnel serves the Tezpur–Tawang route.



Trade seasons and border access can change: do not treat historical trading months as a permanent rule.

Concept illustrations; institutional buildings are schematic.

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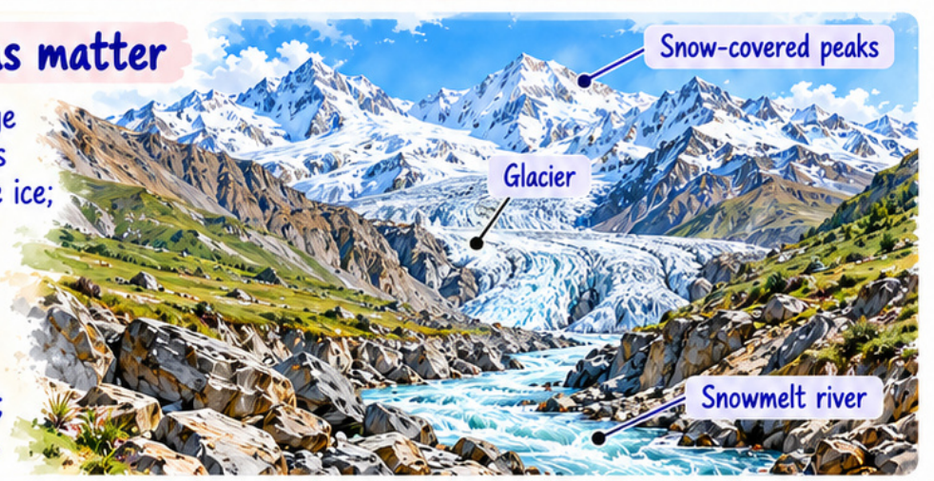
Himalayas: significance and all-weather links

Day 20 | Topic 194 | Geography | Unit D-2 | 9/9

2.6 Why the Himalayas matter

Physical barrier; climatic, drainage and cultural divide. Snowmelt plus rain sustains rivers. Glaciers store ice; Karewas support saffron and duars support tea.

Hill stations, Valley of Flowers and pilgrimage centres support travel. Passes carry older routes; tunnels reduce seasonal isolation.









3 Atal Tunnel: OPEN

Dedicated 3 October 2020 • 9.02 km • Pir Panjal • about 3,000 m



Manali ↔ Lahaul-Spiti year-round; Manali-Leh road shorter by 46 km, saving about 4-5 hours (PIB 2020).

3 Zojila Tunnel: CONSTRUCTION MILESTONE, not an opening

PIB 9 June 2026: main-tunnel breakthrough at Minamarg; nearly 14 km between Baltal and Minamarg on NH-1, at 2,900-3,310 m.



PIB January 2026: whole project exceeds 30 km; target completion 2028. Tunnel length ≠ project length.

Exam trap: Atal's dedication and Zojila's breakthrough are different events.

Concept illustrations; institutional buildings are schematic.

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DAY 20 | TOPIC 195 | Unit D-1 | 1/9

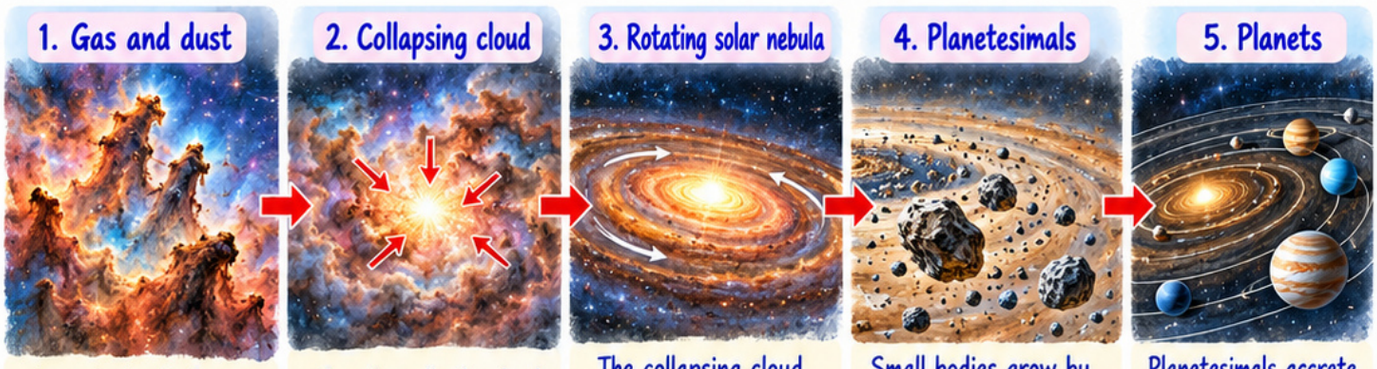
Solar system: origin, order and scale

Day 20 | Topic 195 | Geography | Unit D-1 | 1/9

2.1 From a nebula to planets

About 4.6 billion years ago: gas and dust → collapsing cloud → rotating solar nebula → planetesimals → planets.

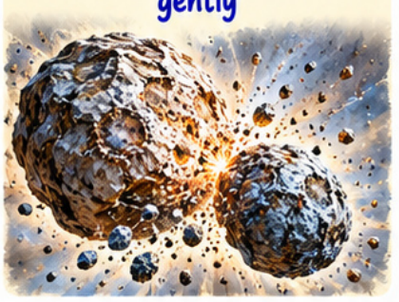
NCERT XI: Kant proposed the idea; Laplace revised it in 1796. In 1950 Otto Schmidt and Carl Weizascar (NCERT spelling) revised the nebular account.



One star—the Sun; eight planets; five IAU-recognised dwarf planets; many moons, asteroids and comets.

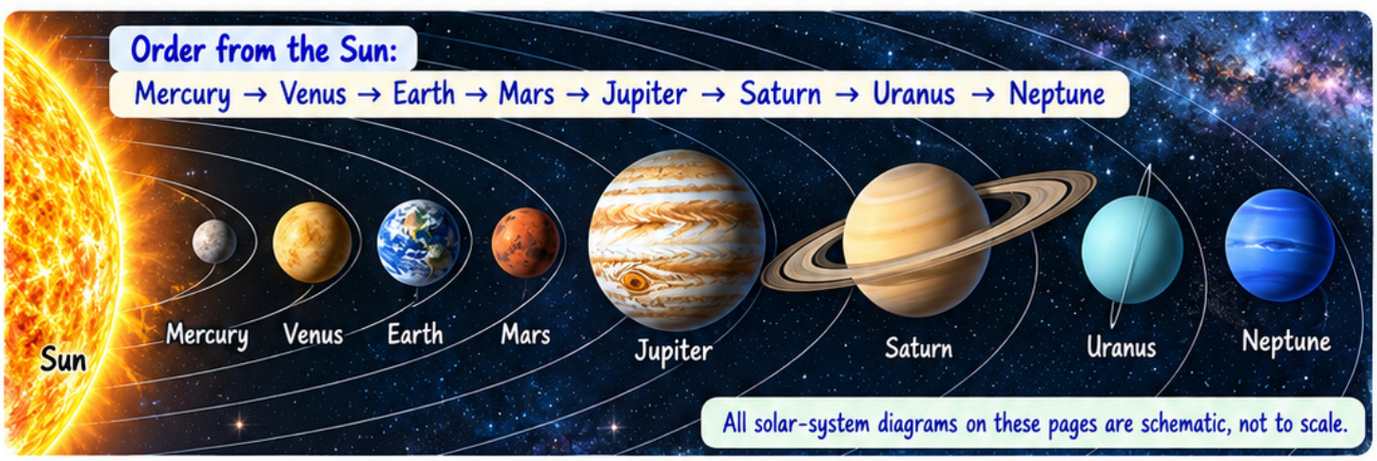


Two planetesimals colliding gently



1 astronomical unit (AU) ≈ 150 million km: the mean Sun–Earth distance.

Recall Topic 7: orbits and Sun–Earth L1.
Topic 177: Mars Orbiter Mission and Aditya-L1.



Concept illustrations; institutional buildings are schematic.

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DAY 20 | TOPIC 195 | Unit D-1 | 2/9

The Sun: layers, energy and activity

Day 20 | Topic 195 | Geography | Unit D-1 | 2/9

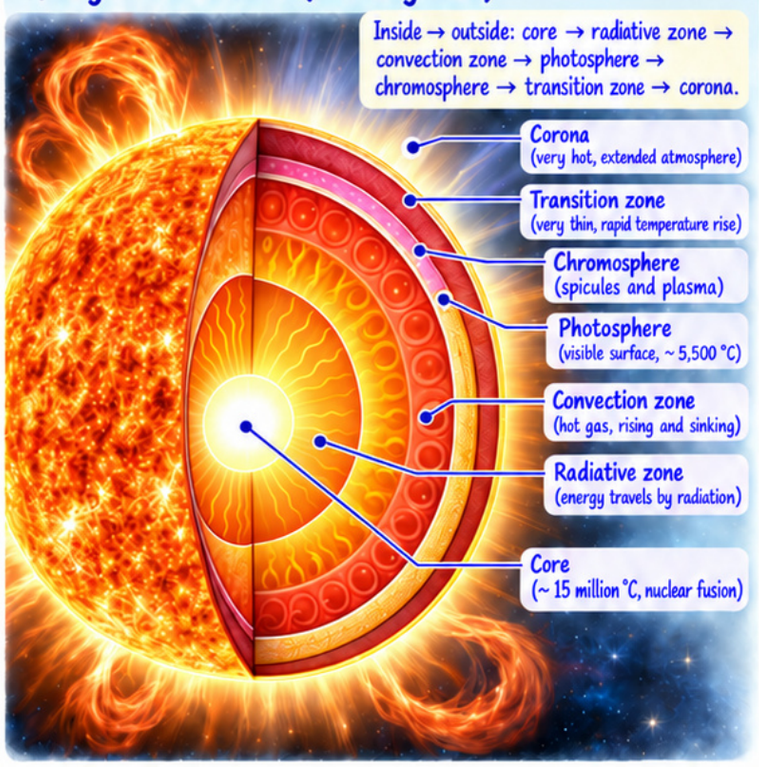
2.2 A G2 V yellow-dwarf main-sequence star

Hydrogen and helium held together by gravity; 99.8% of the solar system's mass.
Core ≈ 15 million °C; photosphere ≈ 5,500 °C.
Earth is about 150 million km away.



1. Layers of the Sun (cutaway view)

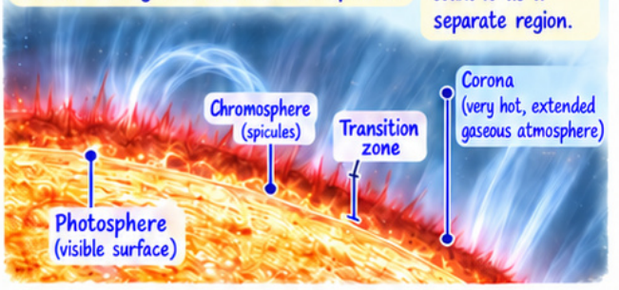
Inside → outside: core → radiative zone → convection zone → photosphere → chromosphere → transition zone → corona.



2. The Sun's atmosphere

Photosphere is the visible surface and the first atmospheric layer. Photosphere, chromosphere and corona belong to the Sun's atmosphere.

The thin transition zone heats rapidly into the corona; not all scientists count it as a separate region.



3. Sunspots and magnetic activity

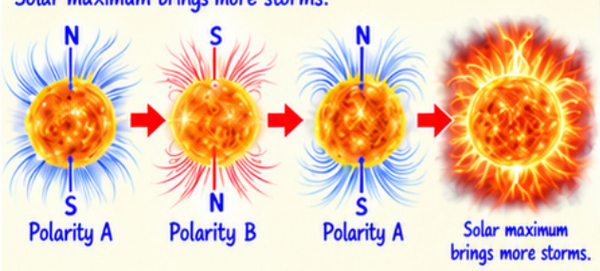
Sunspots: cooler than the surrounding photosphere; persist from days to months.





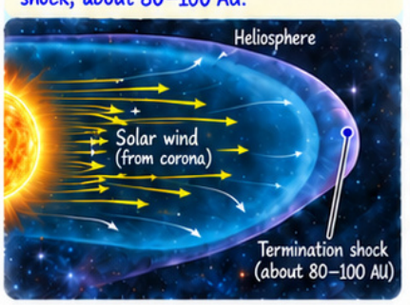
4. Solar magnetic cycle

Magnetic polarity reverses about every 11 years.
Solar Cycle 25 began at the December 2019 minimum.
Solar maximum brings more storms.



5. Solar wind and heliosphere

Solar wind leaves the corona; it forms the heliosphere and slows at the termination shock, about 80–100 AU.



6. Aditya-L1 at Sun-Earth L1

Aditya-L1: halo orbit near Sun–Earth L1, about 1.5 million km from Earth.



Concept illustrations; institutional buildings are schematic.

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Inner planets: four small rocky worlds

Day 20 | Topic 195 | Geography | Unit D-1 | 3/9

2.3–2.5 Inner planets: terrestrial, solid rocky surfaces

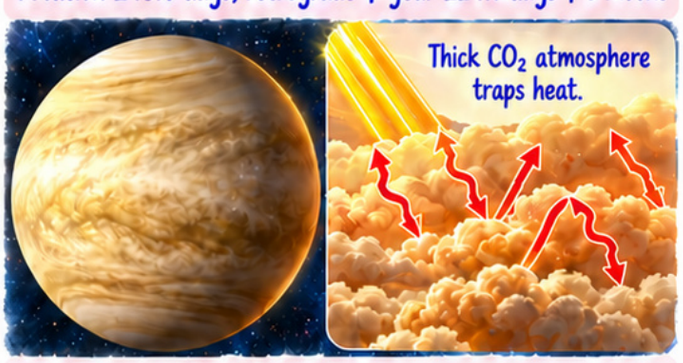


MERCURY | 0.4 AU | diameter 0.38 Earth | rotation 58.6 days | year 88.0 days | 0 moons



Smallest, nearest and fastest planet: about 47 km/s. Daytime about 430 °C; night about −180 °C. Not the hottest.

VENUS | 0.72 AU | diameter 0.95 Earth | rotation 243.0 days, retrograde | year 224.7 days | 0 moons



Hottest: mean 464 °C. Thick CO_2 atmosphere traps heat. Similar to Earth in size; Sun would rise in the west.

EARTH | 1 AU | diameter 1 Earth | rotation 23.9 hours | year 365.2 days | 1 moon



Third planet; liquid water in the habitable zone. Densest planet: about 5.5 g/cm³.

MARS | 1.5 AU | diameter 0.53 Earth | rotation 24.6 hours | year 687.0 days | 2 moons



Rusting iron makes Mars red. Phobos and Deimos may be captured asteroids.

Numbers: NASA Fact Sheet; moon snapshot 18 March 2025.

Concept illustrations; institutional buildings are schematic.

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Outer planets: gas giants and ice giants

Day 20 | Topic 195 | Geography | Unit D-1 | 4/9

2.3–2.5 Outer planets: all four have rings

JUPITER | gas giant

- 5.2 AU
- diameter 11.21 Earth
- rotation 9.9 h
- year 11.9 years
- 95 moons





Largest planet; Great Red Spot; shortest rotation. Ganymede is the largest moon, bigger than Mercury.

SATURN | gas giant

- 9.5 AU
- diameter 9.45 Earth
- rotation 10.7 h
- year 29.4 years
- 274 moons

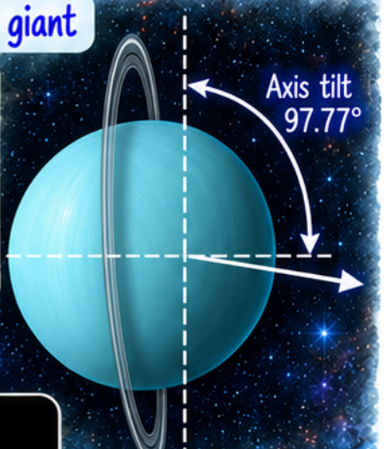


Rings of ice and rock; mean density 0.687 g/cm³, less than water.

Main rings: A, B, C.

URANUS | ice giant

- about 19 AU
- diameter 4.01 Earth
- rotation 17.2 h, retrograde
- year 83.7 years
- 28 moons in snapshot

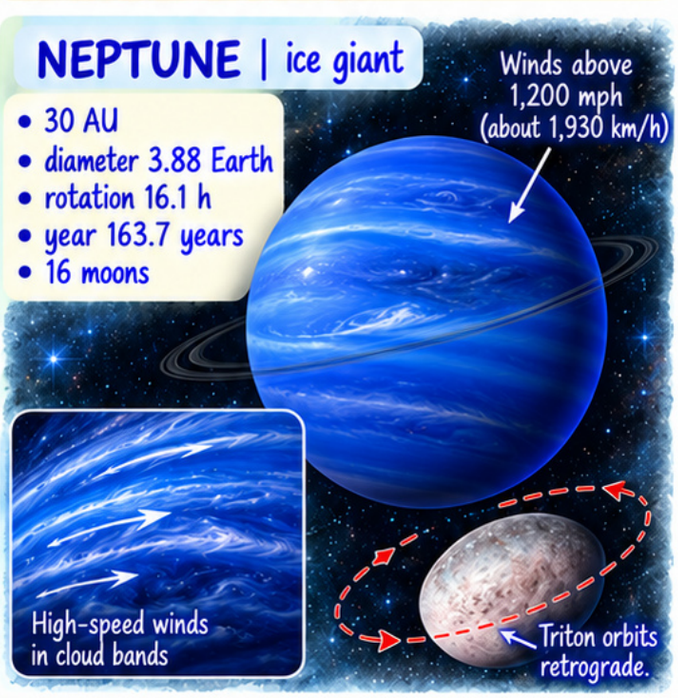




Axis tilt 97.77°: it rotates on its side.

NEPTUNE | ice giant

- 30 AU
- diameter 3.88 Earth
- rotation 16.1 h
- year 163.7 years
- 16 moons



Moon counts: NASA Fact Sheet, 18 March 2025. NASA reported a 29th Uranus moon on 19 August 2025.

Concept illustrations; institutional buildings are schematic.

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Inner versus outer: heat, material and density

Day 20 | Topic 195 | Geography | Unit D-1 | 5/9

2.4 Why are the two groups different?

Near the young Sun, rocky material could survive the heat. Ices and gases collected farther out.



INNER: Mercury, Venus, Earth, Mars.
Small and rocky; densities about 3.9–5.5 g/cm³; no rings; 3 moons in total.



OUTER: Jupiter, Saturn, Uranus, Neptune.
Gas giants and ice giants; densities about 0.7–1.6 g/cm³; all have rings.



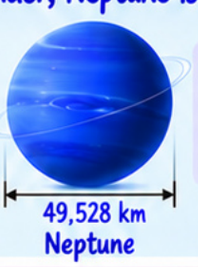
NASA Fact Sheet snapshot, 18 March 2025: outer moons 95 + 274 + 28 + 16 = 413.

Dated update: NASA's Webb report of 19 August 2025 describes S/2025 U1, Uranus's 29th reported moon. Its Facts page still lists 28. Do not present 413 as an undated current total.

Size is not mass: Uranus is wider, Neptune is heavier.



Uranus: 51,118 km; 14.5 Earth masses; about 1.3 g/cm³.

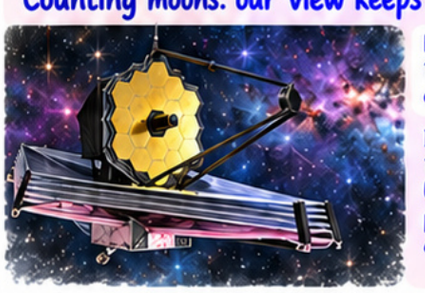


Neptune: 49,528 km; 17.1 Earth masses; about 1.6 g/cm³.

Planet densities: rocky vs gas/ice giants



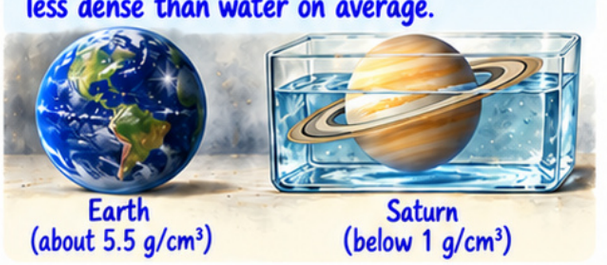
Counting moons: our view keeps improving



NASA Fact Sheet snapshot, 18 March 2025: outer moons 95 + 274 + 28 + 16 = 413.

Dated update: NASA's Webb report of 19 August 2025 describes S/2025 U1, Uranus's 29th reported moon. Its Facts page still lists 28. Do not present 413 as an undated current total.

Earth is densest. Saturn is the only planet less dense than water on average.



Concept illustrations; institutional buildings are schematic.

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Planet records: clocks, tilt and giant landforms

Day 20 | Topic 195 | Geography | Unit D-1 | 6/9

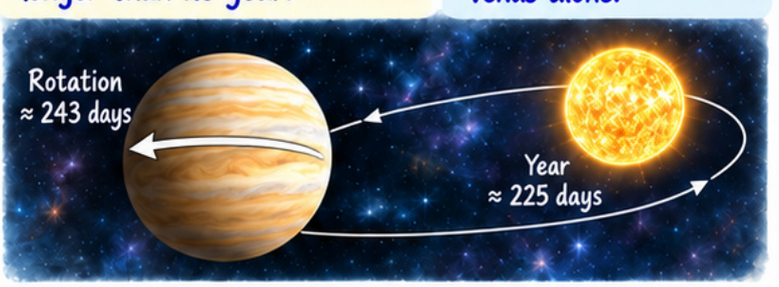
Rotation ≠ solar day ≠ year

Mercury: one rotation ≈ 59 Earth days; solar day ≈ 176 days; year ≈ 88 days.

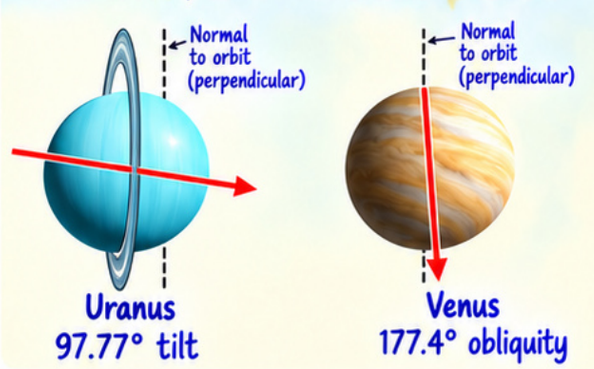


Venus: rotation ≈ 243 days; year ≈ 225 days. Rotation is longer than its year.

Retrograde rotation: Venus and Uranus—not Venus alone.



Uranus rotates on its side: 97.77° tilt. Venus's numerical obliquity is greater, about 177.4°; do not call Uranus "most tilted".



Mars: Olympus Mons is the largest volcano; Valles Marineris is the largest canyon, about 3,870 km long.



Jupiter: 317.8 Earth masses; Great Red Spot storm larger than Earth. Ganymede is larger than Mercury.



Neptune: first planet located through mathematical prediction; Galle found it in 1846 from Le Verrier's prediction.



Three traps:

- hottest ≠ nearest
- most moons ≠ largest planet
- largest moon ≠ a moon of Saturn.

Saturn's 274 confirmed moons: NASA count as of March 2025.



Concept illustrations; institutional buildings are schematic.

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What makes a planet? The 2006 IAU definition

Day 20 | Topic 195 | Geography | Unit D-1 | 7/9

2.6 IAU General Assembly, Prague, 2006

Resolution 5A: a planet must meet ALL THREE conditions

1 Orbits the Sun.



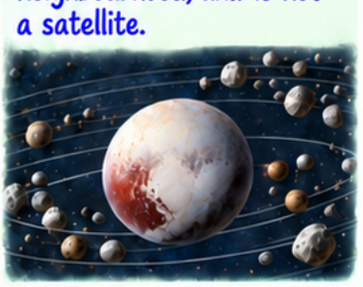
2 Has enough self-gravity to be nearly round.



3 Has cleared the neighbourhood around its orbit.



A dwarf planet meets 1 and 2, has not cleared its orbital neighbourhood, and is not a satellite.



Small Solar-System Bodies: other Sun-orbiting objects, excluding satellites; includes most asteroids and comets.



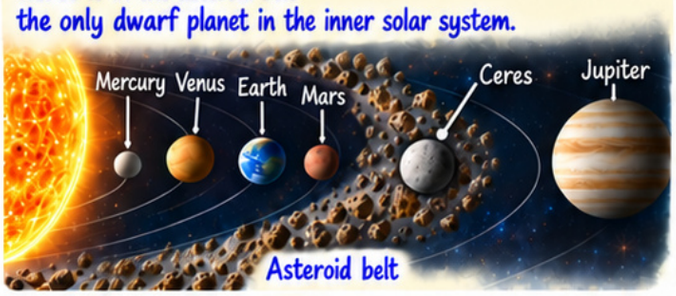
Resolution 6A: Pluto is a dwarf planet and the prototype of a new category of trans-Neptunian objects.



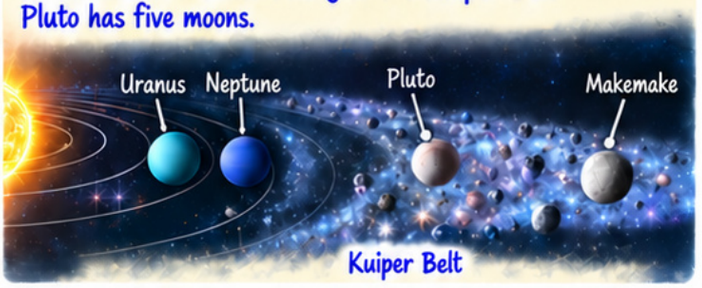
Five recognised dwarf planets in the source checked 23 October 2026:
Ceres, Pluto, Haumea, Makemake, Eris.



Ceres is in the asteroid belt—
the only dwarf planet in the inner solar system.



Makemake and Pluto belong to the Kuiper Belt.
Pluto has five moons.



Exam trap: round + orbiting the Sun is **NOT** sufficient to be a planet.

Concept illustrations; institutional buildings are schematic.

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Smaller bodies: belts, clouds and shooting stars

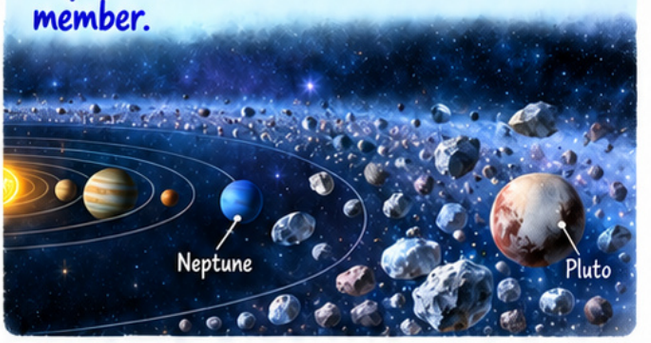
Day 20 | Topic 195 | Geography | Unit D-1 | 8/9

2.7 Small bodies preserve the solar system's history

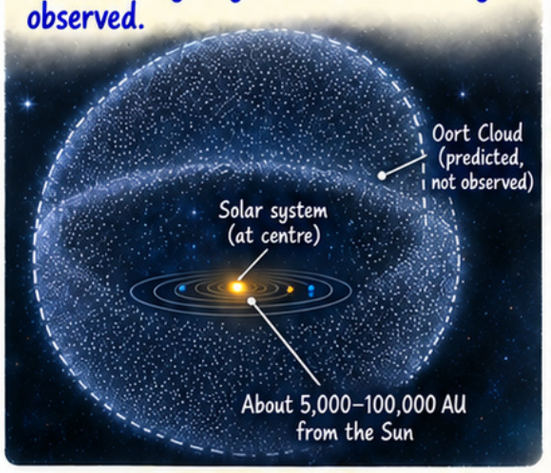
ASTEROID BELT: mainly between Mars and Jupiter. Rocky remnants of formation; Ceres lies here.



KUIPER BELT: icy bodies beyond Neptune's orbit. Pluto is its best-known member.



OORT CLOUD: a predicted thick shell, about 5,000–100,000 AU, reaching about 1.6 light-years. Never directly observed.



COMETS: icy remnants of solar-system formation.



METEOROIDS enter an atmosphere at high speed; the visible burning phenomenon is a METEOR, a "shooting star".



Meteor showers usually arise from comet debris; a few originate from asteroid debris.



Distinguish a flat belt from a roughly spherical shell. The Oort Cloud illustration is a predicted model, not an observed photograph.



Topic 816 covers asteroids, comets, meteors and dwarf planets in detail.

Concept illustrations; institutional buildings are schematic.

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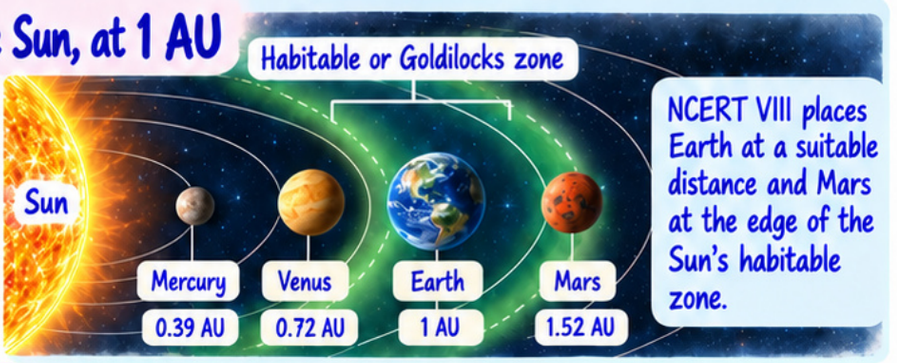
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DAY 20 | TOPIC 195 | Unit D-1 | 9/9

Earth's place: Goldilocks zone and rapid revision

Day 20 | Topic 195 | Geography | Unit D-1 | 9/9

2.8 Earth: third from the Sun, at 1 AU

The habitable or Goldilocks zone is the range of distances where liquid water could persist under suitable conditions. Distance alone does not guarantee life.



NCERT VIII places Earth at a suitable distance and Mars at the edge of the Sun's habitable zone.

Record pairs to remember

Largest—Jupiter (11.21 Earth diameters).



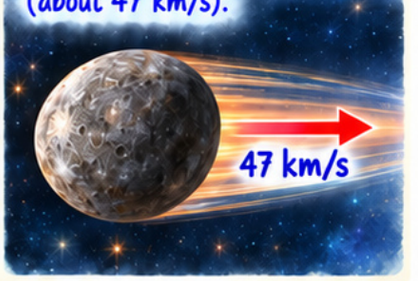
Smallest—Mercury (0.38).



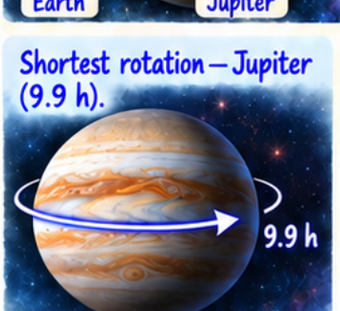
Hottest—Venus (mean 464 °C).



Fastest—Mercury (about 47 km/s).



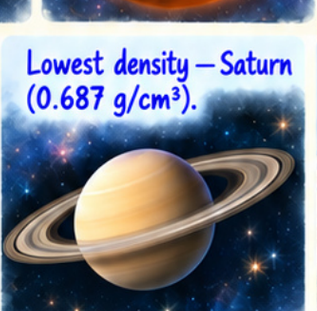
Shortest rotation—Jupiter (9.9 h).



Slowest rotation—Venus (243 days).



Lowest density—Saturn (0.687 g/cm³).



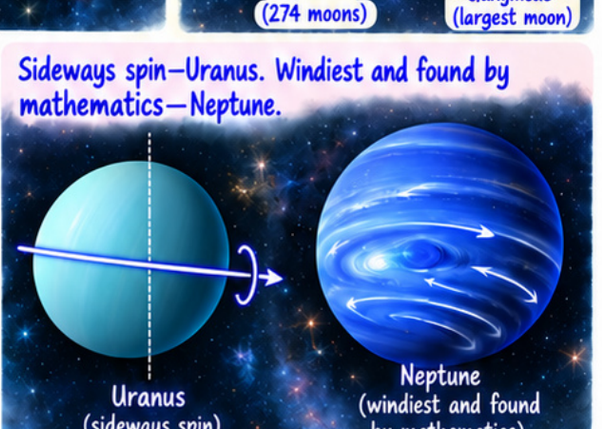
Most confirmed moons in March 2025—Saturn (274). Largest moon—Ganymede (Jupiter).



Largest volcano—Olympus Mons. Largest canyon—Valles Marineris, about 3,870 km. Both are on Mars.



Sideways spin—Uranus. Windiest and found by mathematics—Neptune.



Later topics: Moon and eclipses 415; Earth's rotation 225; revolution 256; small bodies 816.

Concept illustrations; institutional buildings are schematic.

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DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.01

Read the crop, season and measurement

1 2.1–2.2 Foundations

Coastal paddy: Godavari and Krishna deltas and the north coast.



Drier south-west: pulses and groundnut. Chillies, turmeric and fruits are also important.



Kharif: sowing with monsoon onset.



Rabi: winter sowing.



Paddy, groundnut and chillies: BOTH seasons.



Red gram: mainly kharif.



Bengal gram: rabi.



Recall: delta alluvial soils; red and black soils cover much of the rest of the State. Godavari and Krishna canals irrigate the deltas.



2 Key measurements

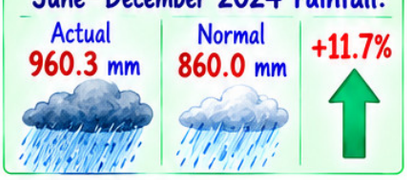
Net irrigated area: 2,936 thousand ha (2020–21).



SES 2024–25: land cultivated 49.55 lakh ha = 30.40% of State land.



June–December 2024 rainfall:



3 Foodgrains, 2024–25 Second Advance Estimates

Area 37.51 lakh ha, up 12.85% from 33.24 (2023–24).



Output 161.86 lakh tonnes, up 12.94% from 143.31.



Paddy 2024–25: area +9.16%; output +12.95% to 127.15 lakh tonnes.



4 District vintage and key terms

District vintage:
13 districts before 4 April 2022;
26 after; 28 from 1 January 2026.
Read each table in its own district boundaries.

Area = land used.
Yield = output per hectare.
Production = total output.

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DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.02

2.3 Agro-climatic zones

IMD Agromet Bulletin 52/2025 • 1 July 2025 • PRE-2022 district names

1. **North Coastal Andhra**
   Srikakulam, Vizianagaram, Visakhapatnam



2. **Godavari**
   East Godavari, West Godavari



3. **Krishna**
   Guntur, Krishna, Prakasam



4. **South Andhra**
   Nellore, Chittoor, Kadapa



5. **Scarce Rainfall**
   Anantapur, Kurnool



6. **High Altitude**
   Srikakulam, Vizianagaram, Visakhapatnam, East Godavari



{ High Altitude OVERLAPS other zones: a district may occur in two zones. These are not six mutually exclusive district groups.

ANGRAU uses North Coastal, Godavari, Krishna, Southern and Scarce Rainfall zone names, with a hill research station at Chintapalle.

3 Zone-to-crop links: compare dates, not boundaries blindly

North coast:



- Srikakulam third in paddy area, 2022-23.

Godavari:



- West Godavari first in paddy area/output, 2022-23.

Krishna zone:



- Krishna second in paddy area, 2022-23.
- Guntur and Prakasam lead chillies, 2020-21.

South Andhra:



- Nellore second in paddy output, 2022-23.
- Chittoor fifth in groundnut area, 2022-23.
- YSR Kadapa third in Bengal gram output, 2020-21.

Scarce Rainfall:



- Ananrhapuramu leads red gram area, 2025-26, and groundnut output, 2022-23.
- Kurnool leads Bengal gram, 2020-21.

No crop table here is specific to the High Altitude zone.
A new district with an old name may cover only part of the old district.

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DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.03

Paddy: yield is not total output

2.4 Paddy • Andhra Pradesh • 2022–23

Total: 21.29 lakh hectares → 126.30 lakh tonnes.

Season	Area (lakh ha)	Output (lakh tonnes)	Yield (tonnes/ha, calculated)
Kharif	14.52	78.05	about 5.4
Rabi	6.77	48.25	about 7.1



Kharif

Area: 14.52 lakh ha

Output: 78.05 lakh tonnes

Yield: about 5.4 tonnes/ha



Rabi

Area: 6.77 lakh ha

Output: 48.25 lakh tonnes

Yield: about 7.1 tonnes/ha

Output = area × yield

Rabi has the HIGHER yield, but the SMALLER area. Its area is less than half the kharif area.

Rabi share of annual output = 48.25 ÷ 126.30 × 100 ≈ 38%, NOT more than half.

District comparison • 26-district list, 2022–23

Area leaders (thousand ha)

1	West Godavari	176
2	Krishna	168
3	Srikakulam	160
4	Kakinada	155

The first four hold about 31% of area.

Output leaders (thousand tonnes)

1	West Godavari	1,201
2	Nellore	1,007

Nellore: fifth in area (151 thousand ha), but SECOND in output (1,007 thousand tonnes). East Godavari: sixth by area.

Read the measure before ranking: area ≠ yield ≠ production.

Concept illustrations are schematic.

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DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.04

Groundnut: two different district leaders

2.4 Groundnut • kharif and rabi



State data, 2022–23: 594 thousand ha; 600 thousand tonnes.

Season	Area (thousand ha)	Output (thousand tonnes)
Kharif	497	328
Rabi	97	272

26-district list, 2022–23: area leaders (thousand ha)

Sri Sathya Sai	Ananthapuramu	Kurnool	Annamayya	Chittoor
204	197	59	40	38

Largest AREA: Sri Sathya Sai.

Largest OUTPUT: Ananthapuramu, 133 thousand tonnes.

2.8 Yield contrast, same 2022–23 table



Sri Sathya Sai: about 473 kg/ha.



Annamayya: about 1,755 kg/ha.

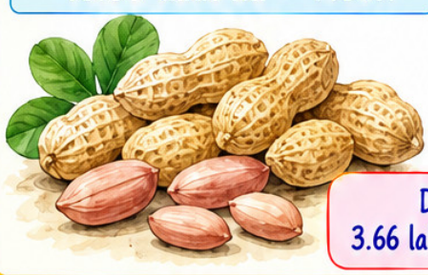
More area does not guarantee more total production or higher yield.

2.5 National comparison • 2023–24 Third Advance Estimates

AP area: 3.66 of India's 48.80 lakh ha ≈ 7.5%.

Gujarat leads: area 16.35 lakh ha; output 36.74 of India's 102.89 lakh tonnes.





AP is NOT among the top five by production.

Do not treat AP's 5.94 lakh ha (State data, 2022–23) and 3.66 lakh ha (national estimate, 2023–24) as rival estimates for one year.

Always specify the measure, year, source and district list.

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APPSC GROUP 1 | 1,000 TOPICS IN 100 DAYS
DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.05

Two pulses: red gram and Bengal gram

RED GRAM • mainly kharif



2025–26 national Third Advance Estimates: AP 0.43 million ha and 0.28 million tonnes; 31.26% of the State's pulse area.

India: 4.46 million ha, 3.59 million tonnes. AP has about a tenth of area and about 8% of output.

Karnataka: most national area (34%). **Maharashtra:** most output (33%).

AP district area, 2025–26, 26-district list (thousand ha):

District	Area (thousand ha)
Ananthapuramu	101.64
Prakasam	52.39
Kurnool	44.40
Nandyal	42.51
Palnadu	36.01
Sri Sathya Sai	24.38

Yield: AP 6.47 quintals/ha; India 8.05. AP is 19.6% below national average.

BENGAL GRAM • rabi



AP 2021–22: area 4.45 lakh ha; output 4.92 lakh tonnes.

India output 137.50 lakh tonnes: AP share 3.58%. Madhya Pradesh leads, 36.96 lakh tonnes.

DISTRICTS use 2020–21, 13-district list:

Kurnool first in area (156 thousand ha) and output (176 thousand tonnes).

District	Output (thousand tonnes)
Prakasam	138
YSR Kadapa	122
Ananthapuramu	38

Ananthapuramu SECOND by area: 92 thousand ha.

Do not merge 2021–22 State totals with 2020–21 district totals.

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DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.06

Chillies, turmeric and commercial crops

2.4 – 2.5 Chillies • kharif AND rabi

2023–24 Spices Board Second Advance Estimates:

	Area	Output
AP	2.47 lakh ha	14.44 lakh tonnes
India	8.09 lakh ha	29.13 lakh tonnes



AP FIRST in chilli production:
14.44 ÷ 29.13 × 100 = 49.57%.

Separate State data, 2022–23:
258 thousand ha; 1,459 thousand tonnes.

District comparison: 2020–21, 13-district list

District	Area	Output
Guntur first	78 thousand ha	456 thousand tonnes
Prakasam second	51 thousand ha	132 thousand tonnes

Kurnool and Krishna follow.



TURMERIC: sources differ—do not silently combine ranks.



SES 2024–25:
AP SECOND.

ANGRAU outlook, using Indiastat 2023–24 advance estimates:
AP EIGHTH; 38.03 of India's 1,054.17 thousand tonnes.

Other crops: cotton, tobacco and sugarcane.

FCV tobacco soil zones (Tobacco Board):



Southern Light Soils + Southern Black Soils → Prakasam and Nellore.



Northern Light Soils → East and West Godavari.



The Tobacco Board at **Guntur** registers Virginia tobacco processors and manufacturers.

Recall sugarcane:
West Godavari and Krishna. These are source district names, not a new boundary map.



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DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.07

Horticulture: productivity is not a production rank

2.6 Horticulture • SES 2024–25

SES 2024–25 reports 18.23 lakh hectares under horticulture. Total output: 365.92 lakh tonnes (2023–24 final estimates, Table 5.7).

The Survey calls AP the largest fruit producer, and ranks it second in mango and sweet orange. Its turmeric rank conflicts with ANGRAU's dated estimate.

The Survey says AP excels in **PRODUCTIVITY** of oil palm, papaya, lime, cocoa, tomato and chillies.

Productivity = output per hectare, not total production rank.



oil palm | papaya | lime | cocoa | tomato | chillies

MANGO • national Ministry of Agriculture table

2017–18 PROVISIONAL production (lakh tonnes):

Uttar Pradesh	45.49
Andhra Pradesh	44.89
India	207.14



AP SECOND; the same table places it second in each year 2014–15 to 2017–18.

This is a historical 2017–18 comparison, not a freshly verified 2026 ranking.

FISH AND SHRIMP • SES 2024–25



Fish ACTUAL: **41.38** lakh tonnes.



Fish TARGET: **56.62** lakh tonnes.



AP has **31%** of India's shrimp exports.



India's fish output: **197** lakh tonnes in 2023–24 (Union minister's reply).

The national and AP fish figures refer to **DIFFERENT YEARS**: do not draw a same-year national-share chart.

Horticulture, field crops and fisheries are distinct sub-sectors; do not interchange their units or totals.

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DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.08

Two palms, two different national ranks

2.6 Oil palm versus coconut

OIL PALM



AP 2020–21 area: 1.86 lakh ha out of India's 3.70 lakh ha.

More than half of national area → no other State can have more. Highest AREA, worked out from these figures.

AP 2023–24 district area: Eluru 116,073 of State total 226,527 ha; East Godavari and Kakinada follow.

Do not mix the 2020–21 national comparison with the 2023–24 district figures.

COCONUT • Ministry final estimates, 2022–23



AP FOURTH in area and production.

Area: AP 106.86 of India's 2,277.18 thousand ha.

Production: AP 1,705.98 of India's 20,535.88 MILLION NUTS.

Karnataka, Kerala and Tamil Nadu are above AP by production.

Yield: AP 15,964 nuts/ha; national 9,018 nuts/ha.

High yield does not mean first in total production.

Konaseema is known for coconut trees and paddy: islands between Godavari distributaries and the Bay of Bengal, in Dr B.R. Ambedkar Konaseema district.

Remember: oil palm–most AREA (2020–21); coconut–FOURTH output (2022–23). Nuts are not tonnes.

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DAY 21 | TOPIC 206 | Geography | Unit D-4 | 206.09

GI identity, farm returns and exam checks

2.7 Agricultural geographical indications

Guntur Sannam Chilli
- 2010–11



Banaganapalle Mangoes
- 2017–18
- Andhra Pradesh + Telangana



Araku Valley Arabica Coffee
- 2018–19
- Andhra Pradesh + Odisha



These three GI registrations are agricultural goods.

Tirupathi Laddu and Bandar Laddu are **FOODSTUFFS**, not agricultural goods.

2.8 Red gram economics · kharif 2025 ANGRAU cost study

Return: ₹48,766 per hectare.



−

Cost: ₹63,207 per hectare.



→ Net return = 48,766 − 63,207 = **−₹14,441** per hectare.

A high output does not guarantee a positive farm return.

4 Three checks before answering

1. Which measure?
In groundnut 2022–23, Sri Sathya Sai leads AREA; Ananthapuramu leads OUTPUT.



2. Which district list?
Bengal gram 2020–21 uses 13 old districts; paddy 2022–23 uses 26. Kakinada appears in the latter.



3. Which rank?
Largest total fruit producer does not mean first in every fruit. Yield, area and production ranks need not agree.



Question checklist: CROP → SEASON → YEAR/ ESTIMATE → UNIT → DISTRICT VINTAGE → MEASURE.

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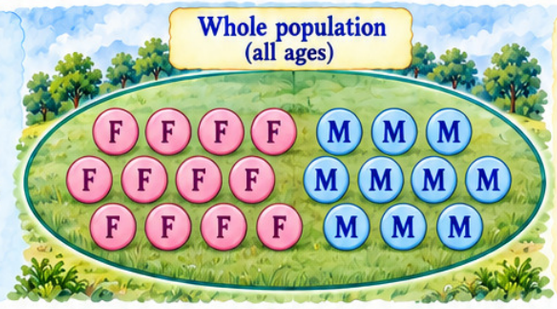
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Three ratios: choose the population first

ONE WORD, THREE DIFFERENT MEASURES

Overall sex ratio

It includes every age in the population counted.



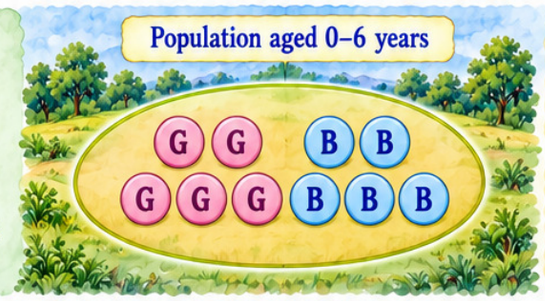
Overall sex ratio =

$$\frac{\text{Females (all ages)}}{\text{Males (all ages)}} \times 1{,}000$$

It includes every age in the population counted.

Child sex ratio

It concerns children aged 0–6 years only.



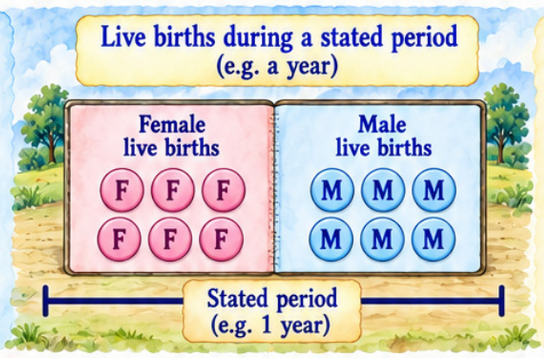
Child sex ratio =

$$\frac{\text{Girls aged 0–6}}{\text{Boys aged 0–6}} \times 1{,}000$$

Both numerator and denominator must belong to the same age group.

Sex ratio at birth

It concerns births during a stated period, not all children already living in the population.



Sex ratio at birth =

$$\frac{\text{Female live births}}{\text{Male liive births}} \times 1{,}000$$

It concerns births during a stated period, not all children already living in the population.

WHICH SOURCE?

Census	Counts the population and the 0–6 age group.
SRS	Estimates births through sample registration.
HMIS	Records births reported to the health system.
NFHS	Surveys households and birth histories.

READ THE UNIT BEFORE THE NUMBER

- India normally reports **females per 1,000 males.**
- Some international presentations reverse the sexes or use a base of 100.
- An older geography teaching example gives 102 males per 100 females, with Latvia 85 and Qatar 311 in the same orientation. These are historical textbook examples, not current world rankings.
- A ratio above 1,000 means females outnumber males only when the unit is females per 1,000 males.

RULE

Write measure + age or birth period + source + year + unit together.
Never substitute the total population for the male denominator.

Keep measure, source, year and unit together.

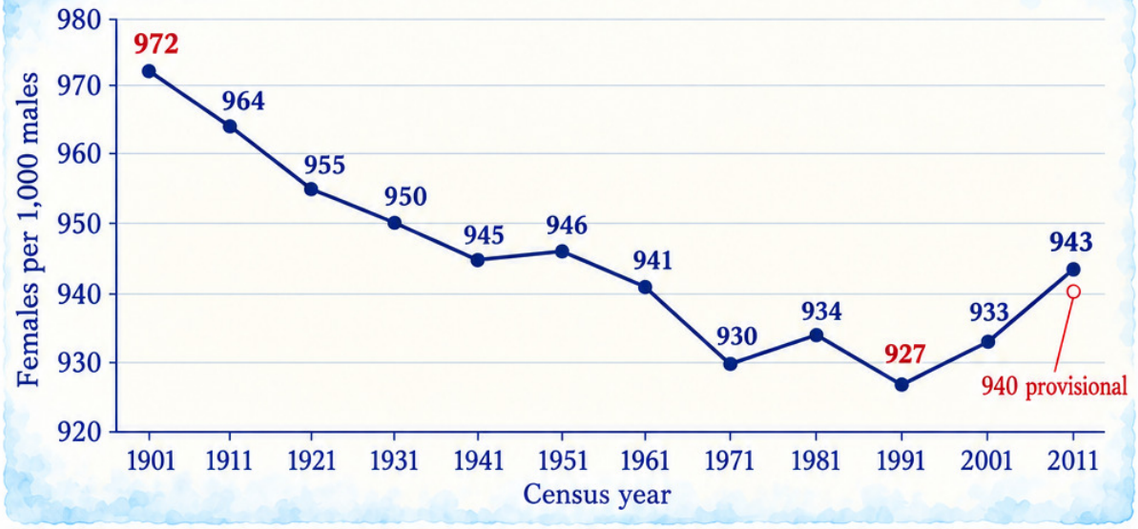
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The overall Census series, 1901–2011

FEMALES PER 1,000 MALES



The overall pattern

The broad twentieth-century movement was downward, but not every decade fell. There were increases in 1951 and 1981, followed by a sustained rise from 1991 to 2011.

Turning points in this series

- The highest value is 972 in 1901.
- The lowest is 927 in 1991.
- The increase was 6 points from 1991 to 2001 and 10 points from 2001 to the final 2011 figure.

Provisional is not final

NATMO's thematic note prints 940 for 2011 because it uses provisional population totals. The final 2011 overall ratio is 943. A provisional estimate and a final table are different releases of the same Census, not two separate Census years.

Read the graph carefully

- The vertical axis is a ratio, not population in millions and not a percentage.
- A rise of 10 points means ten more females per 1,000 males in the ratio; it does not mean a ten-per-cent increase in the female population.

Source: Census of India (1901–2011).
Measure: Females per 1,000 males. 2011 final = 943.
Non-zero vertical-axis range: 920–980. Each point is one Census year.

Concept illustrations are schematic; not historical reconstructions.

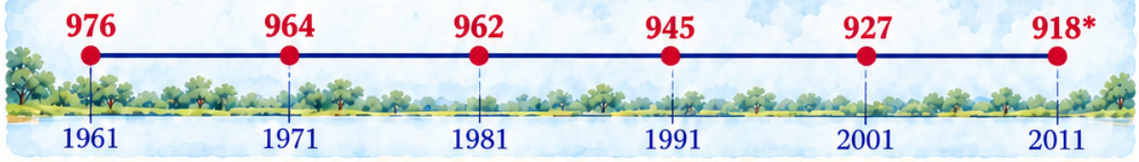
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Child ratio: a different direction

GIRLS PER 1,000 BOYS AGED 0–6

Chronology of values — not a scaled graph

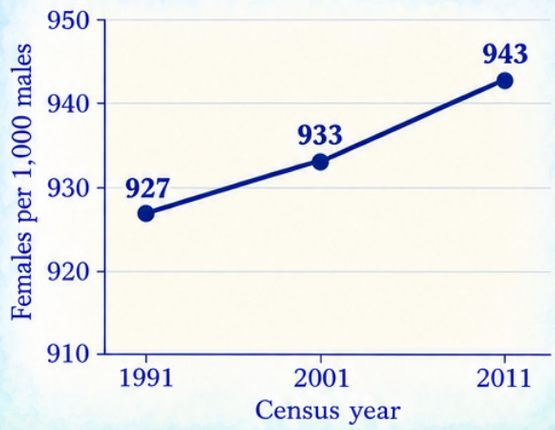


This historical series shows a persistent decline in the child ratio. It does not describe births alone: children may survive or die between birth and the Census reference date.

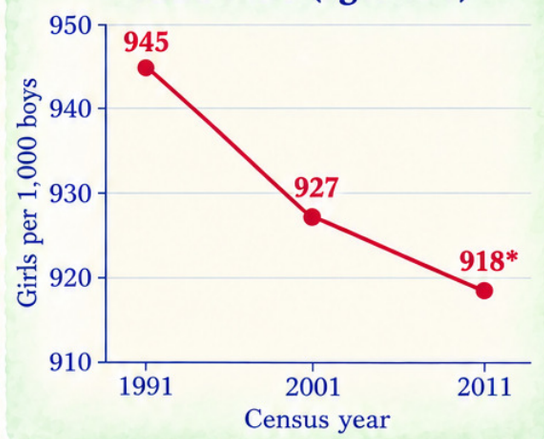
TWO TRENDS CAN COEXIST

From 1991 to 2011, the overall ratio rose from 927 to 943. Over those years the child ratio fell from 945 to 918 in the official table used here. Improvement in the all-age ratio therefore does not prove an improvement among young children.

Overall ratio



Child ratio (ages 0–6)



RELEASE LABELS MATTER

The provisional 2011 child ratio was 914. Do not attach that figure to a graph labelled final data.

*The Ministry of Health and Family Welfare's 25 November 2016 Census table reports India at 918. Other official presentations also reproduce 919; retain the stated table and edition when interpreting a question rather than silently mixing releases.

READING A CHANGE

Using the selected table, 927 − 918 = 9 fewer girls per 1,000 boys from 2001 to 2011.

That is a ratio-point change, not a count of missing children. Different denominators prevent a direct conversion into an absolute population loss.

Measure: girls per 1,000 boys. Source: Census of India (MoHFW table), 25 November 2016. Years: 1961, 1971, 1981, 1991, 2001, 2011.
Note: same non-zero vertical scale (910–950) for both graphs. *918: MoHFW table, 25 November 2016.

Concept illustrations are schematic; not historical reconstructions.

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Overall ratio: States and UTs in 2011

These are final Census 2011 overall ratios, expressed as females per 1,000 males. State and Union-territory rankings must be kept separate.

States in 2011

Kerala	**1,084**
1,000 parity	
Tamil Nadu	996
Undivided Andhra Pradesh	993
Punjab	895
Sikkim	890
Jammu and Kashmir	889
Haryana	879

Union territories in 2011

Puducherry	**1,037**
1,000 parity	
Andaman and Nicobar Islands	876
NCT of Delhi	868
Chandigarh	818
Dadra and Nagar Haveli	774
Daman and Diu	618

Key results: States

Kerala: 1,084 — highest among States.
Haryana: 879 — lowest among States.
Tamil Nadu: 996; undivided Andhra Pradesh: 993.

Other relatively low values included Jammu and Kashmir, then a State: 889; Sikkim: 890; and Punjab: 895.

Key results: Union territories

Puducherry: 1,037 — highest among UTs.
Daman and Diu: 618 — lowest among UTs.

Other values: Dadra and Nagar Haveli 774; Chandigarh 818; NCT of Delhi 868; Andaman and Nicobar Islands 876.

The 1,000 threshold

Among the then States and UTs, Kerala and Puducherry exceeded 1,000.
Tamil Nadu and undivided Andhra Pradesh were below it despite being near parity.

Historical boundaries are part of the data

Daman and Diu and Dadra and Nagar Haveli were separate UTs in 2011. Andhra Pradesh had not yet been divided in 2014, and Jammu and Kashmir was not yet reorganised in 2019.
A present-day administrative label cannot be pasted onto a 2011 statistic without checking its geographical coverage.

Source: Census of India 2011 (final). **Measure:** Females per 1,000 males.
2011 administrative units. Dashed line = parity (1,000). No current-boundary inference.

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Child ratio: the ranking changes

CENSUS 2011: AGES 0–6

Census Table (Ages 0–6)
Published on 25 November 2016

Use the Ministry of Health and Family Welfare's Census table published on 25 November 2016.
Every value below is girls per 1,000 boys, not the all-age sex ratio.

STATES: HIGHEST AND LOWEST

Arunachal Pradesh	972	Highest among States.
Meghalaya	970	
Mizoram	970	
Kerala	964	
Punjab	846	
Haryana	834	Lowest among States.

UNION TERRITORIES

Andaman and Nicobar Islands	968	Highest among UTs.
Daman and Diu	904	
NCT of Delhi	871	Lowest among UTs.



WHY THE RANKINGS DIFFER

Overall sex ratio leader ≠ Child ratio leader

Kerala leads the overall ratio. ≠ Arunachal Pradesh leads the child ratio.

- Overall sex ratio (all ages) Leader: Kerala
- Child ratio (ages 0–6) Leader: Arunachal Pradesh

Overall UT lowest ≠ Child UT lowest

Daman and Diu has the lowest overall UT ratio. ≠ Delhi has the lowest child UT ratio.

- Overall sex ratio (all ages, UTs) Lowest: Daman and Diu
- Child ratio (ages 0–6, UTs) Lowest: NCT of Delhi

One measure does not identify the leader or laggard in another.

AVOID A PROVISIONAL–FINAL MIX

Provisional tables placed:	
Mizoram	971
Haryana	830

→

The selected final table gives:	
Mizoram	970
Haryana	834
Arunachal Pradesh	972

A ranking requires a complete label: measure, age group, geography, reference year and release. Even a correctly remembered number becomes misleading when attached to the wrong label.

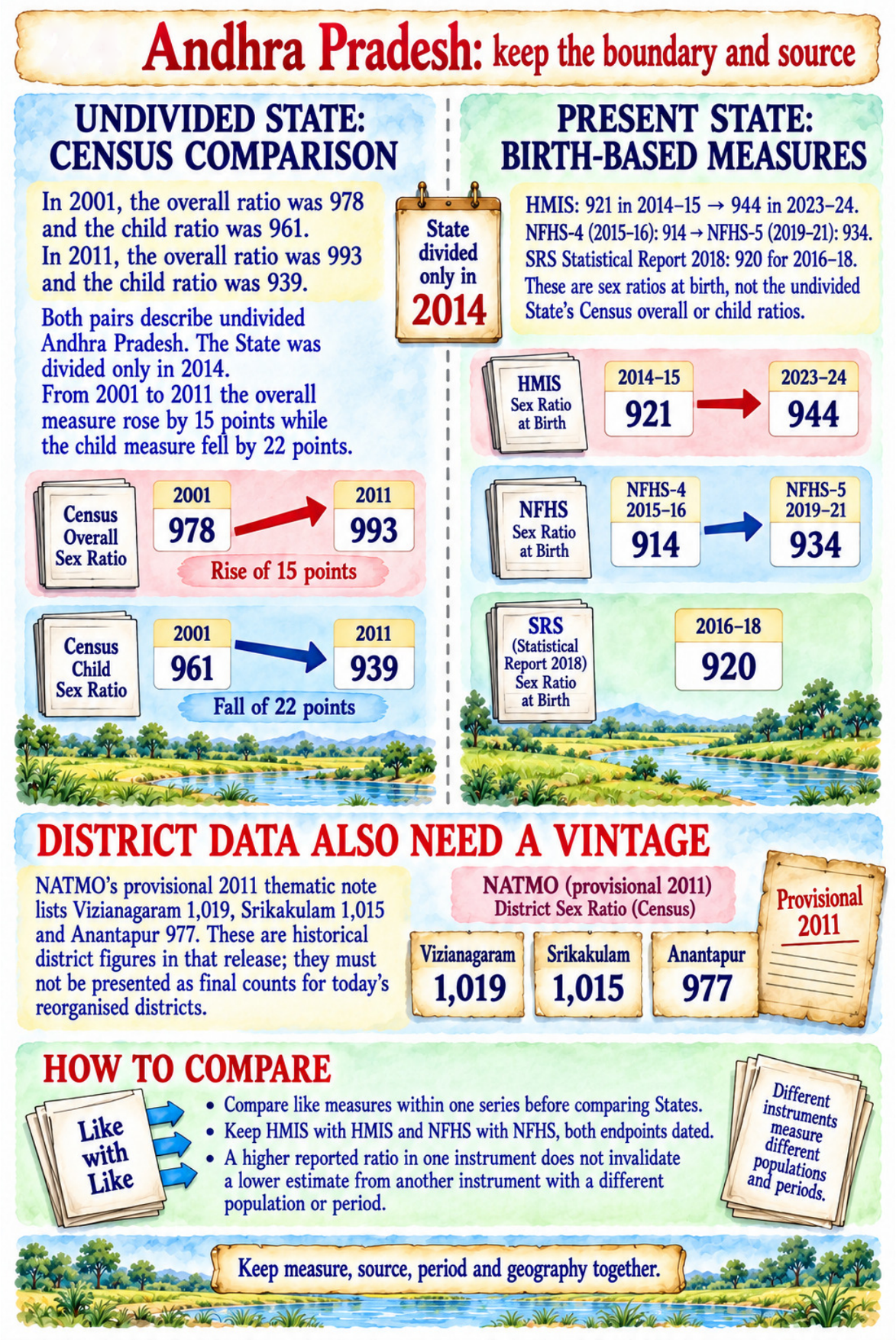
Keep together:

Measure	Age group	Geography	Reference year	Release
Girls per 1,000 boys	Ages 0–6	States or Union Territories	Census 2011	Ministry of Health and Family Welfare table published on 25 November 2016

Concept illustrations are schematic; not historical reconstructions.

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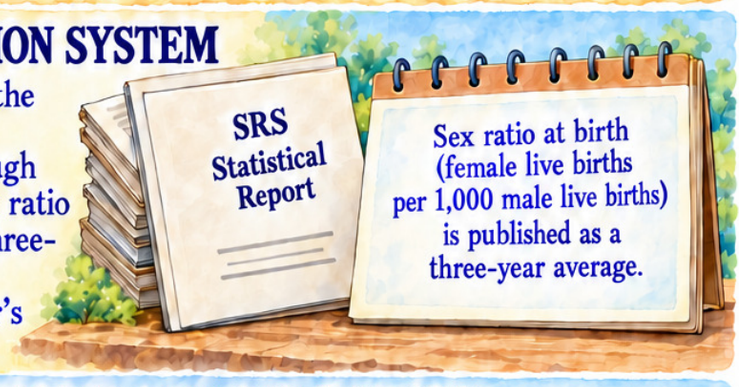
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SRS: three-year birth estimates

SAMPLE REGISTRATION SYSTEM

SRS, run by the Office of the Registrar General, India, estimates vital events through sample registration. Its sex ratio at birth is published as a three-year average, reducing dependence on a single year's births.



THREE-YEAR ROLLING WINDOWS

Window / India SRB	2021	2022	2023	2024
2021–23: 917	Included	Included	Included	—
2022–24: 918	—	Included	Included	Included

Overlap: 2022–23 (two years)

SELECTED SRS MEASUREMENTS (SEX RATIO AT BIRTH)

2006–08
India: 904
Haryana: 847
Punjab: 836
Delhi: 877

2016–18
India: 899
Andhra Pradesh: 920
Reported in SRS Statistical Report 2018.

2021–23
India: 917
Reported in SRS Statistical Report 2023.

2022–24
India: 918
Reported in SRS Statistical Report 2024, released in May 2026 and confirmed by the Health Ministry on 1 October 2026.

LABEL THE PERIOD, NOT JUST THE REPORT YEAR



The 2024 report does not mean 918 was measured for the single calendar year 2024. The figure covers female live births per 1,000 male live births over 2022–24.

OVERLAPPING WINDOWS

2021–23 and 2022–24 share two years. Their one-point difference is not a comparison of two wholly separate three-year populations and is not by itself proof that one scheme caused a change.



READING RULE

Always retain SRS + birth ratio + three-year period.
Do not compare this birth measure directly with the all-age Census ratio as if the two had the same denominator.

Measure: sex ratio at birth (female live births per 1,000 male live births) | Source: SRS (Office of the Registrar General, India)
Period: three-year average (2006–08, 2016–18, 2021–23, 2022–24) | Geography: India and specified States/UTs as labelled.

Concept illustrations are schematic; not historical reconstructions.

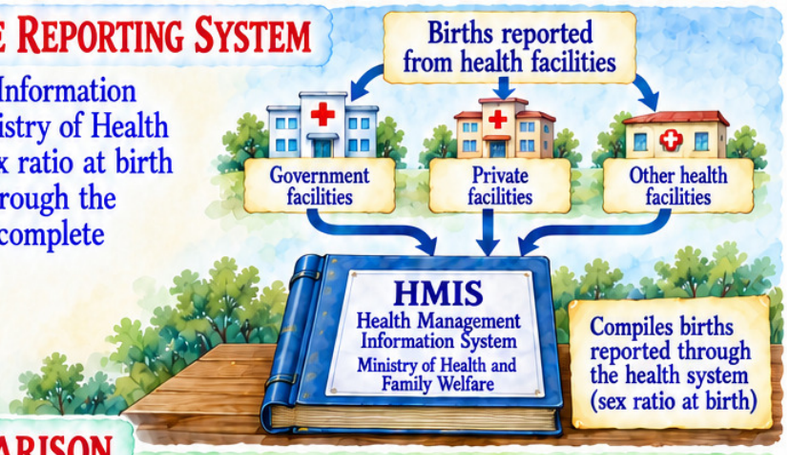
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HMIS: births reported to the health system

An Administrative Reporting System

The Health Management Information System belongs to the Ministry of Health and Family Welfare. Its sex ratio at birth reflects births reported through the health system; it is not a complete Census of every resident.



The Source Comparison

In a Lok Sabha reply on 4 April 2025, the Ministry of Women and Child Development gave these HMIS values:

Female live births per 1,000 male live births

The periods are financial years, not Census dates or SRS three-year windows.

	2014–15 (financial year)	2023–24 (financial year)	Source
India (HMIS)	918	930	Lok Sabha reply, 4 April 2025 (Ministry of Women and Child Development)
Andhra Pradesh (HMIS)	921	944	Lok Sabha reply, 4 April 2025 (Ministry of Women and Child Development)

A Newer Dated Update

A PIB note of 6 March 2026 gives India's HMIS ratio as 929 in 2024–25. Keep this newer value separate from the earlier 930 for 2023–24; both can be correct for their stated periods.

	2024–25 (financial year)	Source
India (HMIS)	929	PIB note, 6 March 2026

Interpretation

The government uses HMIS trends in reporting on Beti Bachao Beti Padhao. A trend is useful for monitoring, but a before-and-after comparison alone cannot isolate the programme's causal effect.



Check Coverage

Administrative reporting depends on which births are recorded, how consistently facilities report and whether definitions remain comparable. Do not relabel HMIS as SRS or treat its figure as a household-survey estimate.



Measure: female live births per 1,000 male live births | **Sources:** Lok Sabha reply, 4 April 2025; PIB note, 6 March 2026
Periods: financial years (2014–15, 2023–24, 2024–25) | **Geography:** India and Andhra Pradesh (HMIS)

Concept illustrations are schematic; not historical reconstructions.

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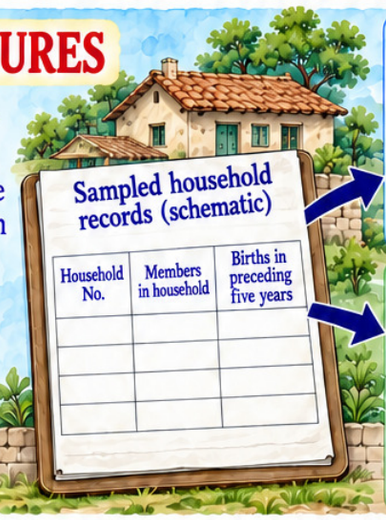
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NFHS household survey and birth histories

WHAT NFHS MEASURES

The National Family Health Survey is conducted under the Ministry of Health and Family Welfare, with the International Institute for Population Sciences as the nodal agency.

Its estimates come from sampled households, not a full population enumeration.



All household members
(from the sampled households)
F M F M F M F M

Overall sex ratio of the household population
1,020
females per 1,000 males

Births in the preceding five years
(from the sampled households)
F births
M births

Sex ratio at birth
929
female births per 1,000 male births

NFHS-4 TO NFHS-5: INDIA (BIRTH RATIO)

NFHS-4 (2015–16) gave India's birth ratio as 919. The NFHS-4 to NFHS-5 comparison therefore concerns 919 → 929, not 943 → 1,020.

NFHS-4 (2015–16)	NFHS-5 (2019–21)
919 →	929

India: sex ratio at birth
(female births per 1,000 male births)

STATE EXAMPLES, SAME SURVEY SERIES

Andhra Pradesh's birth ratio: 914 → 934.
Kerala's birth ratio: 1,047 → 951.

The reference is NFHS-4 to NFHS-5; these are dated survey estimates, not current Census rankings.

	NFHS-4 (2015–16)	NFHS-5 (2019–21)	
Andhra Pradesh	914 →	934	Birth ratio (female births per 1,000 male births)
Kerala	1,047 →	951	Birth ratio (female births per 1,000 male births)

DO NOT MERGE INSTRUMENTS

Census 2011's overall ratio of 943 and NFHS-5's 1,020 cover different years and use different methods. NFHS-5 does not revise the 2011 Census result.

The overall and birth indicators also have different populations within the survey itself. A population may have more women overall while its births still include more boys than girls. Always keep the indicator's complete wording.

Census 2011
(whole population)
Overall sex ratio
943
females per 1,000 males
Population: all usual residents
Method: full population enumeration
Year: 2011
Geography: India

NFHS-5
(sampled households)
Overall sex ratio
1,020
females per 1,000 males
Population: household members from sampled households
Method: sample survey
Period: 2019–21
Geography: India

Sex ratio at birth
929
female births per 1,000 male births
Population: children born in preceding five years to women in sampled households
Method: sample survey
Period: 2019–21
Geography: India

Concept illustrations are schematic; not historical reconstructions.

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Mechanisms: birth, survival and migration

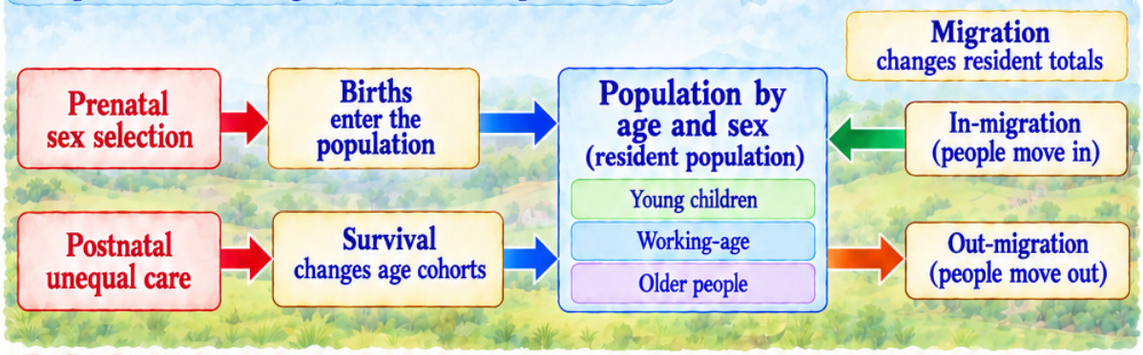
DO NOT CONFUSE A MEASURE WITH ITS CAUSE

An unfavourable ratio can reflect several processes. Its interpretation depends on whether the population is births, young children or all ages.

Different populations give different ratios

- **Births** (sex ratio at birth)
- **Young children** (child sex ratio)
- **All ages** (overall sex ratio)

Population change: three main processes

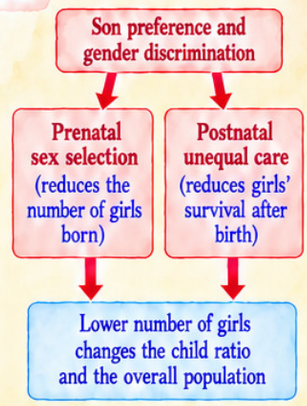


Discrimination and survival

Son preference and gender discrimination may encourage sex-selective practices, female infanticide and unequal access to nutrition or health care. Neglect can affect girls' survival after birth, changing the child ratio as well as the overall population.

Historical ORGI discussions highlighted excess female infant mortality and neglect.

That historical explanation should not be converted into an undated claim that female infant mortality is always higher in every State or every later year.



Natural birth patterns are not the whole explanation

More male than female births can occur without discrimination. A low observed ratio needs evidence on the magnitude, context and change; it is not enough simply to note that the figure is below 1,000.

Natural variation at birth

More male than female births can occur naturally → A low observed ratio needs evidence on the magnitude, context and change.

Migration changes the resident population

When working-age men move out, the origin area's overall ratio can rise even if women's social position has not improved. The destination may show the opposite pattern.

Effect of male out-migration (conceptual)

F stays unchanged / M decreases → Working-age men move out (out-migration) → F stays unchanged / M decreases → F/M rises

Data quality

Undercount and age misreporting must be considered. An ORGI technical note finding particular effects negligible in its analysis is not a universal guarantee of error-free measurement.

Possible data issues

- Undercount
- Age misreporting

These can affect measured ratios and must be considered.

Conclusion

Use demographic evidence together with health, education, safety and opportunity indicators.

Keep measure, source, period and geography together.

Concept illustrations are schematic; not historical reconstructions.

IAS WITH DR RAVI
AIM. PREPARE. ACHIEVE

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DAY 22 | TOPIC 215 | Geography | Unit D-3 | 215.11

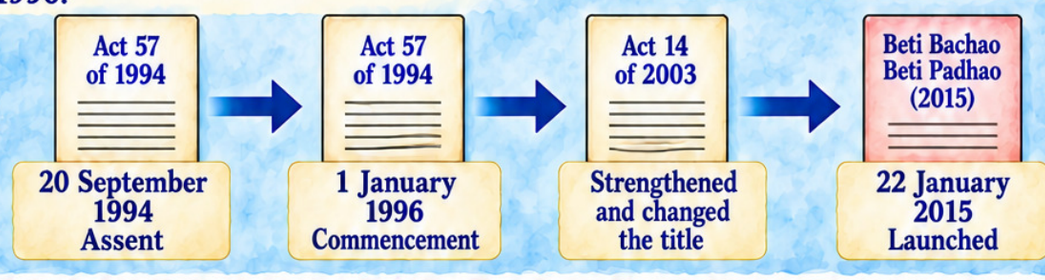
Law and social action

PCPNDT: THE LEGAL FRAMEWORK

The original Pre-Natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994 was **Act 57 of 1994.** It received assent on **20 September 1994** and came into force on **1 January 1996.**



Act 14 of 2003 strengthened it and changed the title to the **Pre-Conception and Pre-Natal Diagnostic Techniques (Prohibition of Sex Selection) Act, 1994.**



WHAT IS PROHIBITED?

Section 3A



Sex selection before or after conception.

Section 5(2)



Communicating the sex of the foetus.

Section 6



Using prenatal diagnostic techniques, including ultrasonography, for sex determination; sex selection is also prohibited.

Section 22



Advertisements concerning prohibited sex determination or sex selection.

The law **does not ban every ultrasound examination.** It regulates diagnostic facilities and permits lawful diagnostic purposes subject to its requirements.

Lawful medical ultrasound (for diagnostic purposes)



Permitted, subject to legal requirements.

BETI BACHAO BETI PADHAO



Launched on **22 January 2015** at **Panipat, Haryana.**
Its objectives concern preventing gender-biased sex-selective elimination and supporting girls' survival, protection and education.

The Ministry of Women and Child Development works with the Ministry of Health and Family Welfare and the Ministry of Education.

COMPLEMENTARY ROUTES

- Awareness
- Equal care
- Schooling
- Community action

Law targets prohibited conduct. Awareness, equal care, schooling and community action address the social conditions behind discrimination.

Neither a law's existence nor a favourable headline statistic alone proves full implementation.

Concept illustrations are schematic; not historical reconstructions.

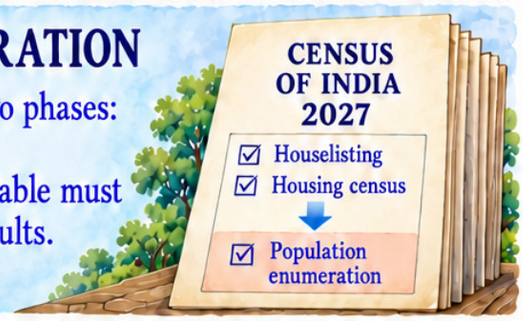
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Census 2027: a schedule is not a result

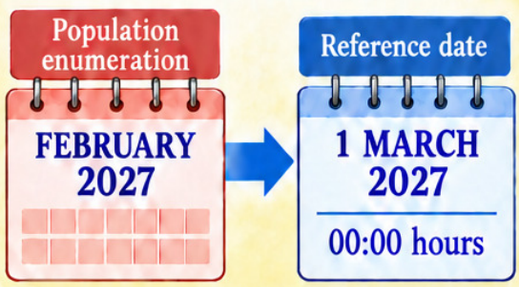
THE NEXT COMPLETE ENUMERATION

The Census of India 2027 programme has two phases: houselisting and housing census, followed by population enumeration. Its announced timetable must not be mistaken for published population results.



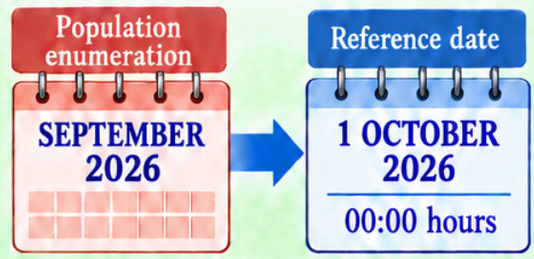
MOST OF INDIA

Population enumeration is scheduled for February 2027. The reference date is 00:00 hours on 1 March 2027.



SNOW-BOUND, NON-SYNCHRONOUS AREAS

For Ladakh and the specified snow-bound areas of Jammu and Kashmir, Himachal Pradesh and Uttarakhand, population enumeration was scheduled for September 2026, with the reference date 00:00 hours on 1 October 2026.



These are the government's announced arrangements; they do not provide a new national sex ratio in advance of released results.

RESULTS REQUIRE RELEASE
No new national ratio until official results.

THE FIVE-LABEL CHECK



1. **Measure:** overall, child or birth?
2. **Population:** all ages, ages 0–6 or live births?
3. **Source:** Census, SRS, HMIS or NFHS?
4. **Time:** reference date, financial year, survey round or three-year average?
5. **Geography and release:** present boundaries or historical units; provisional or final?

KEEP THE OLDER DATA HONEST

Census 2011 remains a historical baseline. SRS and HMIS can supply newer birth indicators, but neither becomes a replacement Census headcount. A careful comparison preserves both what each source tells us and what it cannot tell us.



Keep measure, source, period and geography together.

Concept illustrations are schematic; not historical reconstructions.

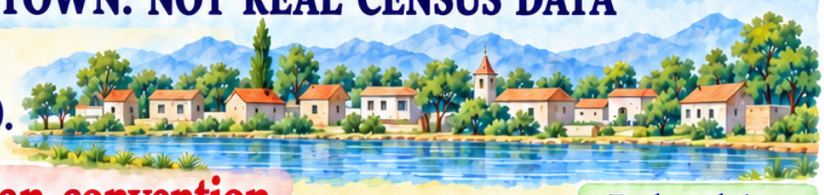
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DAY 22 | TOPIC 215 | Geography | Unit D-3 | 215.13

Worked ratios: the denominator decides

ILLUSTRATIVE TOWN: NOT REAL CENSUS DATA

Males = 52,000.
Females = 48,360.



Sex ratio: Indian convention

Females (per 1,000 males) = $\frac{48,360}{52,000} \times 1,000$ → = 930 females per 1,000 males

The denominator is males, not the town's total population of 1,00,360. Dividing females by total population gives a female population share, a different statistic.

Total population = 1,00,360

~~$\frac{48,360}{1,00,360}$~~

Not a sex ratio denominator
(This gives a female population share, not females per 1,000 males.)

REVERSE THE ORIENTATION

Males per 1,000 females = $\frac{52,000}{48,360} \times 1,000$ → ≈ 1,075.3 approximately 1,075

Males per 100 females = $\frac{52,000}{48,360} \times 100$ → ≈ 107.5

The same town gives different numerical values when the direction or base changes. Always carry the unit with the answer.

CHILD RATIO

Suppose girls aged 0–6 = 5,888 and boys aged 0–6 = 6,400.

Child sex ratio (girls per 1,000 boys) = $\frac{5,888}{6,400} \times 1,000$ → = 920 girls per 1,000 boys



CHECK BEFORE FINISHING

- ✓ Use only the specified age group.
- ✓ If given a total and one sex, subtract to obtain the other sex first.
- ✓ If boys outnumber girls, girls per 1,000 boys must be below 1,000.
- ✓ Keep full precision during calculation and round only the final value.
- ✓ These are worked calculations, not population estimates or survey findings.

Measure: sex ratio (females per 1,000 males, or males per 1,000 or per 100 females)
Source: Illustrative data **Period:** Not specified **Geography:** Illustrative town (not real census data)

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DAY 22 | TOPIC 216 | Geography | Unit D-2 | 216.01

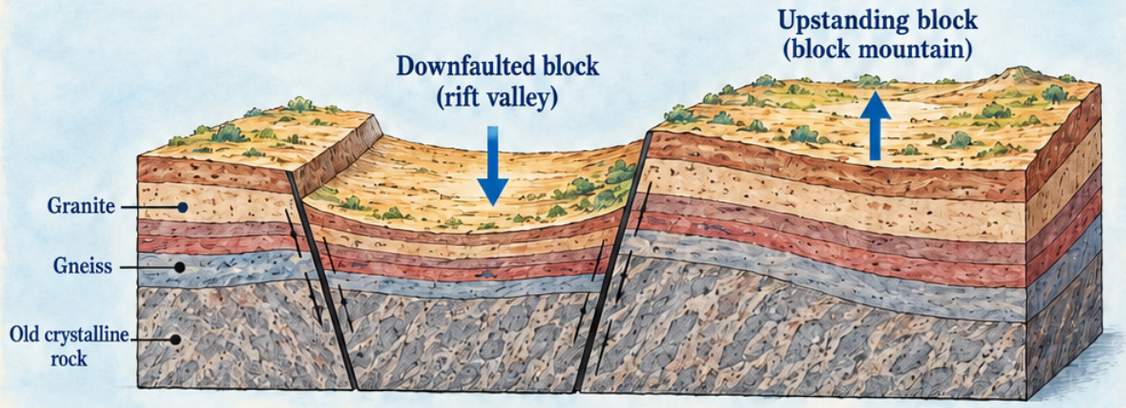
An ancient plateau, not an immobile block

The Peninsular Plateau is one of India's oldest and most stable landmasses. It is a tableland of ancient crystalline, igneous and metamorphic rocks, with broad, shallow valleys and rounded hills.

NCERT CLASS IX links its origin to the breaking and drifting of Gondwana land. **Class XI** emphasises ancient gneisses and granites and describes it as a rigid block since the Cambrian period.

STABLE DOES NOT MEAN MOTIONLESS.

The block has experienced vertical movements and faulting. NCERT gives the Narmada, Tapi and Mahanadi rift valleys and the Satpura block mountains as examples. The Bhima fault is associated with recurrent seismic activity.



Compare the old, relatively rigid plateau with the young Himalayan mountain system.
Age, rock structure and tectonic behaviour explain different landforms.

Peninsular Plateau



Old, relatively rigid plateau.

Himalayan mountain system



Young Himalayan mountain system.

TWO TEXTBOOK CLASSIFICATIONS:

Class IX (two groups)
- Central Highlands
- Deccan Plateau

Class XI (three groups)
- Central Highlands
- Deccan Plateau
- North-eastern Plateau

The third group is an extension of the Peninsular block, not part of the young Himalayan ranges.

Learn the physical relationships rather than treating a single list as the only classification.
Topic 136 introduced the six broad physical divisions; this topic develops the plateau's hills, peaks and passes.

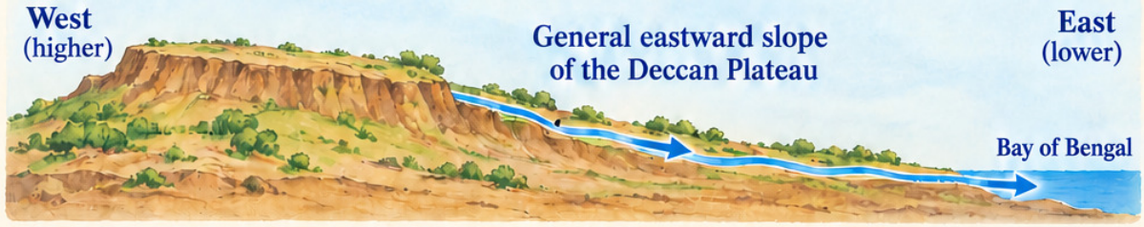
Conceptual diagrams; not to scale.

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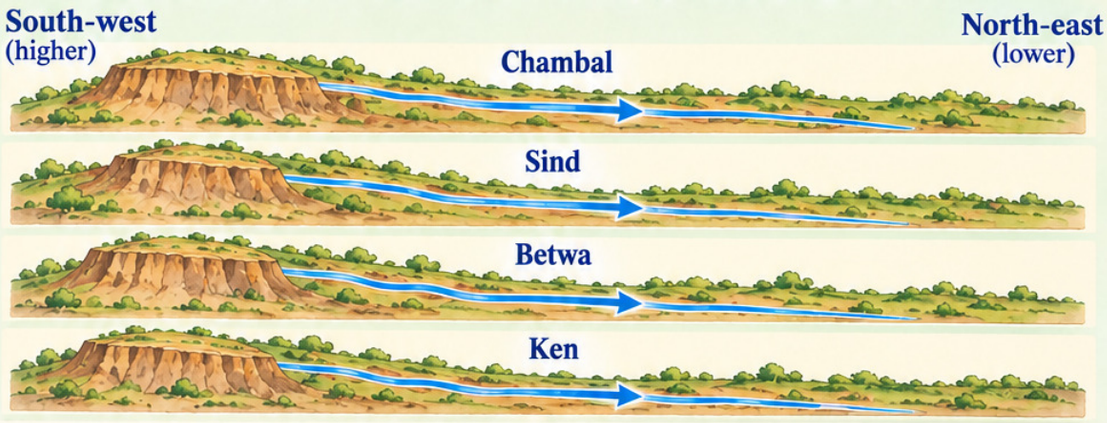
APPSC GROUP 1 | 1,000 TOPICS IN 100 DAYS
DAY 22 | TOPIC 216 | Geography | Unit D-2 | 216.02

Read the slope from the rivers

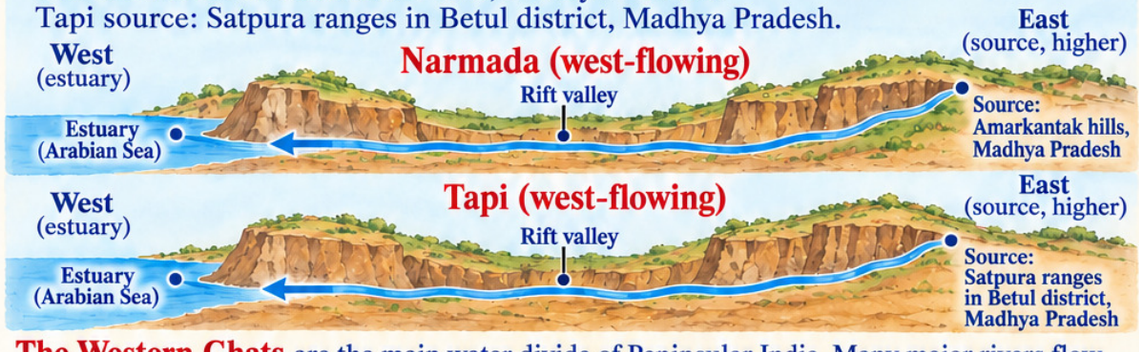
THE GENERAL PENINSULAR SLOPE is from west to east.
NCERT describes the Deccan Plateau as higher in the west and gently sloping eastwards.
The land rises from roughly 150 m above the river plains to about 600–900 m.
Do not confuse this broad plateau range with the heights of individual peaks.



CENTRAL HIGHLANDS: a different directional pattern.
They stand around 700–1,000 m and slope towards the north and north-east.
The Chambal, Sind, Betwa and Ken flow from south-west to north-east.



WEST-FLOWING EXCEPTIONS: The Narmada and Tapi flow west through rift valleys rather than following the plateau's general eastward slope. Both form estuaries.
Narmada source: Amarkantak hills, Madhya Pradesh.
Tapi source: Satpura ranges in Betul district, Madhya Pradesh.



The Western Ghats are the main water divide of Peninsular India. Many major rivers flow across the plateau towards the Bay of Bengal; short streams also descend the steep western side.

REVISION RULE: general slope, regional slope and fault-controlled drainage are three different ideas. The Narmada and Tapi do not prove that the entire plateau slopes west.

Detailed river systems are covered in Topic 266.

Conceptual diagrams; not to scale.

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DAY 22 | TOPIC 216 | Geography | Unit D-2 | 216.03

Central Highlands: follow the eastward extensions

- **NORTH OF THE NARMADA** lies the Central Highlands, including much of the Malwa plateau.
- The **Aravalis** bound the region on the west and north-west. NCERT places the Vindhyan range with the Satpura to its south and the Aravalis to its north-west.
- The Central Highlands contain highly denuded, relict mountains and rocks such as **marble, slate and gneiss**. Malwa also includes extensive **basaltic terrain.**

Rocks and mineral resources



Marble Slate Gneiss

Basalt (extensive in Malwa)

Mineral resources (important in Chotanagpur)

EASTWARD EXTENSIONS (CLASS IX)

Malwa → Bundelkhand and Baghelkhand → Chotanagpur

Eastward regional extensions; not a single ridge or a travel route.

Rajmahal hills and Chotanagpur relative position (CLASS XI)

Rajmahal hills (eastern extension of the Central Highlands)

Southwards

Chotanagpur

Chotanagpur (CLASS XI)

- Drained by the **Damodar** and important for its mineral resources.
- Class XI places it south of the Rajmahal hills and names the Rajmahal hills as an eastern extension of the Central Highlands.

Damodar river and Chotanagpur

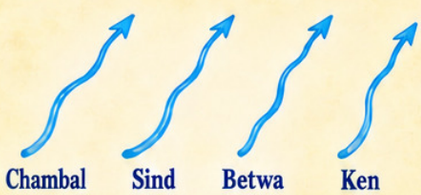


Damodar drains Chotanagpur

Chotanagpur is drained by the Damodar and is important for its mineral resources.

Regional drainage (CLASS IX)

- **Chambal, Sind, Betwa** and **Ken** run towards the north and north-east, consistent with the slope.



Chambal Sind Betwa Ken

Run towards the north and north-east (consistent with the slope).

Narmada as the main reference line

- The Narmada is the main reference line for distinguishing the Central Highlands to its north from the Deccan to its south.



Keep the name sets separate

- **Bundelkhand and Baghelkhand** are the Central Highlands' eastward extensions.
- The textbook's discussion of the Deccan uses a different set of hill names.

Conceptual diagrams; not to scale.

Concept illustrations are schematic; not historical reconstructions.

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DAY 22 | TOPIC 216 | Geography | Unit D-2 | 216.04

Deccan, Deccan Trap and the north-eastern extension

DECCAN PLATEAU: a roughly triangular landmass south of the Narmada. The Western Ghats form its western edge and the Eastern Ghats its eastern edge.

Class XI names the Satpura, Maikal range and Mahadeo hills on its northern side.

Class IX describes the Satpura along the broad northern base and names Mahadev, Kaimur and Maikal among its eastern extensions.



Kaimur – source-wise mention

Class IX
includes it in that Deccan discussion; names Mahadev, Kaimur and Maikal among its eastern extensions.

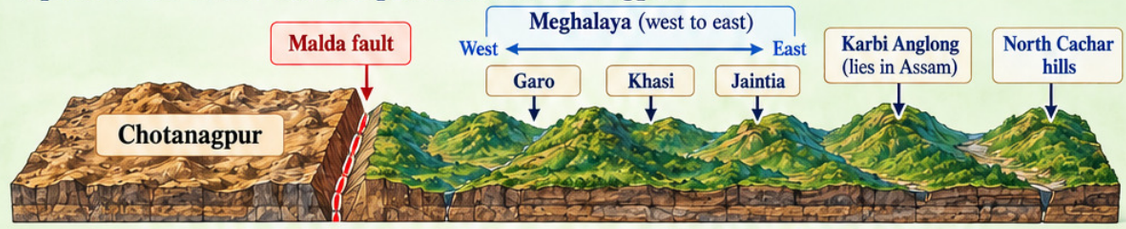
Class XI
mentions the Vindhyan and Kaimur ranges while discussing the Central Highlands and Yamuna tributaries.

Preserve the textbook context rather than forcing the labels into one rigid scheme.

DECCAN TRAP: volcanic terrain with igneous rocks and extensive black soil, especially in western and north-western parts of the plateau.



NORTH-EASTERN PLATEAU: the Meghalaya and Karbi Anglong plateau and North Cachar hills are extensions of the Peninsular block. The Malda fault separates the north-eastern part from Chotanagpur.



Do not identify this ancient plateau extension as a young Himalayan range.

Heavy south-west monsoon rain has strongly eroded the surface; NCERT describes Cherrapunji as bare and rocky.

Conceptual diagrams; not to scale.

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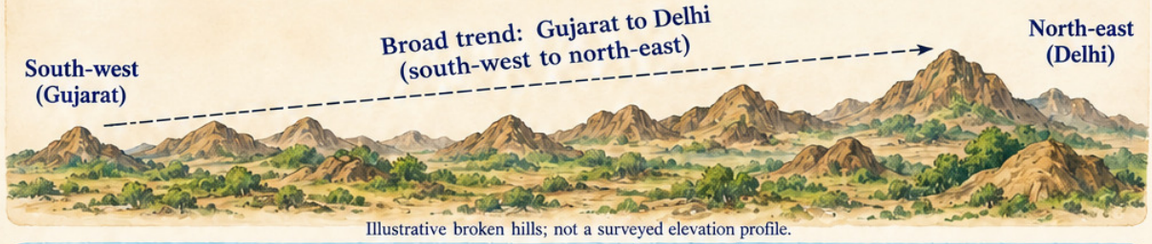
APPSC GROUP 1 | 1,000 TOPICS IN 100 DAYS
DAY 22 | TOPIC 216 | Geography | Unit D-2 | 216.05

Aravalis and the two Ghats

ARAVALIS: highly eroded, broken hills on the western and north-western margins of the Peninsular plateau. Their broad trend is Gujarat to Delhi, south-west to north-east.

Guru Shikhar on Mount Abu is the highest Aravali summit, about 1,722 m.

The range should not be drawn as a continuous wall like a young, sharply uplifted mountain chain.



Illustrative broken hills; not a surveyed elevation profile.

WESTERN GHATS:

the western edge of the Deccan, parallel to the western coast. They are comparatively continuous and are crossed through passes. Sahyadri is a familiar regional name.

NCERT HEIGHT COMPARISON:
Western Ghats: average 900–1,600 m (Class IX); about 1,500 m (Class XI).



EASTERN GHATS:

the eastern edge, extending from the Mahanadi valley towards the Nilgiris. They are lower, irregular and discontinuous, cut through by major rivers draining towards the Bay of Bengal.

NCERT HEIGHT COMPARISON:
Eastern Ghats: average about 600 m.



- The Western Ghats generally become higher southwards.
- Averages are not the heights of the highest peaks.
- The Mahanadi, Godavari, Krishna and Kaveri interrupt the Eastern Ghats.
- Do not transfer the Western Ghats' "continuous and crossed by passes" description to the Eastern Ghats.

Conceptual diagrams; not to scale.

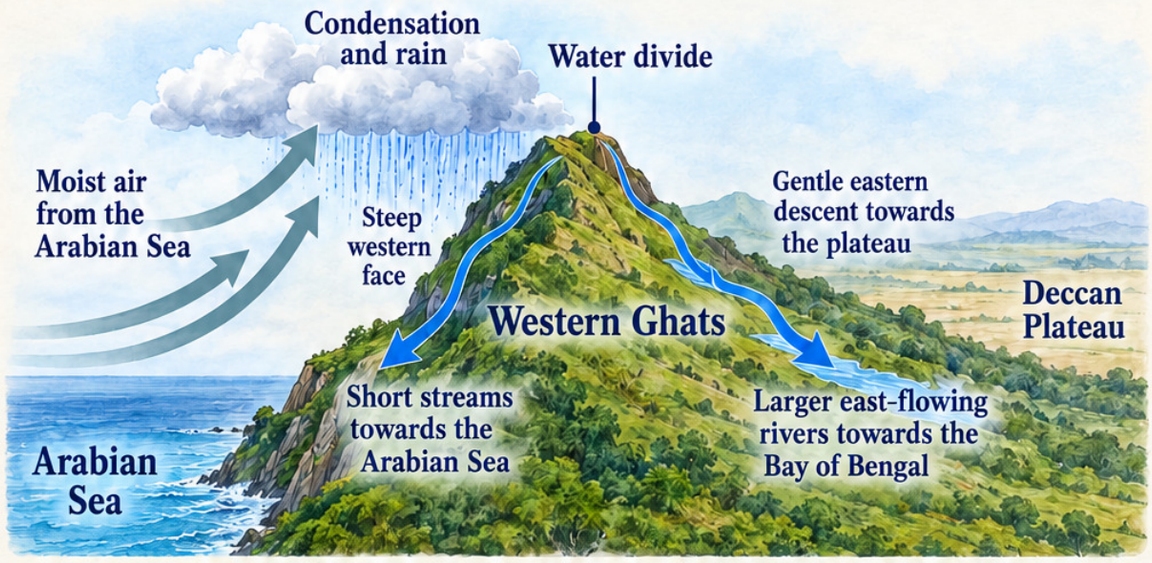
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Western Ghats: water divide and orographic rain

The Western Ghats are a major barrier along the western margin of the Deccan and the principal water divide of Peninsular India.

MOIST AIR FROM THE ARABIAN SEA rises along the western slopes. Rising air cools, moisture condenses and rain falls: orographic rainfall.



The western face is steep; the eastern side descends more gently towards the plateau. The drawing is a conceptual cross-section, not a surveyed terrain profile.

Several large east-flowing rivers originate in or near the Western Ghats, while short streams descend towards the Arabian Sea. A water divide separates drainage directions; it is not itself a river.

REGIONAL NAMES AND HILLS:
Sahyadri in Maharashtra;
Nilgiris around Karnataka and Tamil Nadu;
Anaimalai and **Cardamom** hills farther south, especially in **Kerala**.

PEAK–RANGE PAIRINGS



Highest Peninsular peak in the Anaimalai hills

Highest peak of the Nilgiris in the Nilgiris

Do not exchange the peak and hill-range pairings.

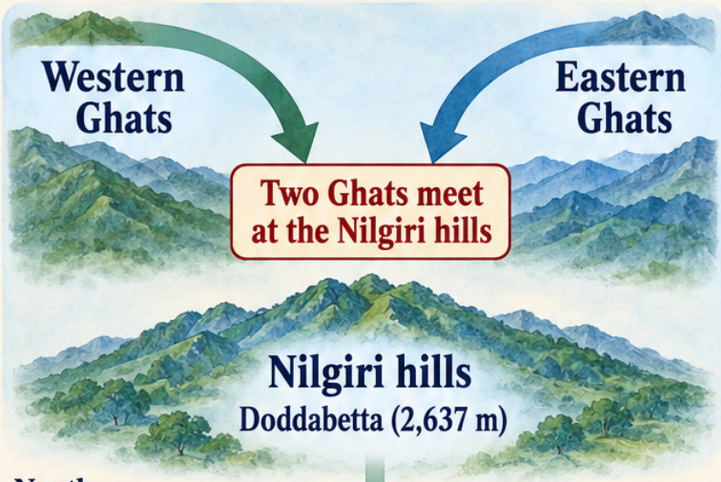
RELIEF AND WATER USE: river descents create waterfalls and hydropower opportunities. Jog Falls on the Sharavati is one example; drainage details belong with the river-system topics.

Conceptual diagrams; not to scale.

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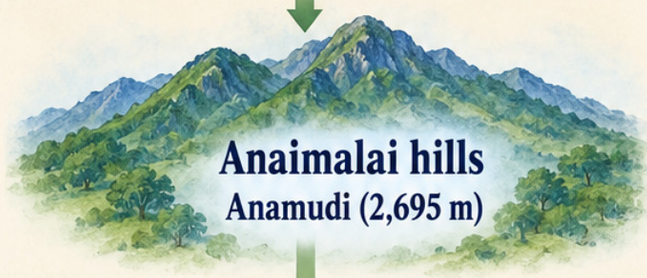
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DAY 22 | TOPIC 216 | Geography | Unit D-2 | 216.07

Peaks and the southern hill junction



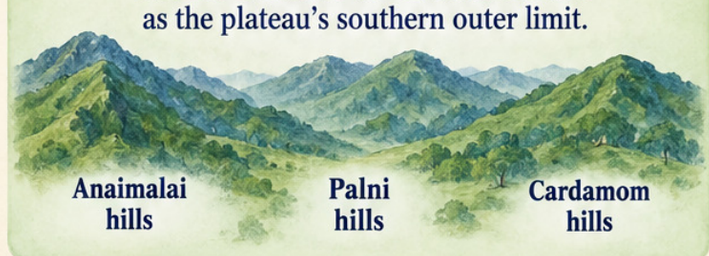
North

Palghat / Palakkad Gap
lies between the Nilgiris to the north and the Anaimalai hills to the south.
Do not put Anamudi north of this gap.



South

Southern highland system
The Anaimalai, Palni and Cardamom hills form the southern highland system; NCERT identifies the Cardamom hills as the plateau's southern outer limit.



Javadi / Jawadhu Hills



Javadi / Jawadhu Hills lie in northern Tamil Nadu and are an extension of the Eastern Ghats.

NCERT Class IX also names the Shevroy hills in the south-eastern discussion.

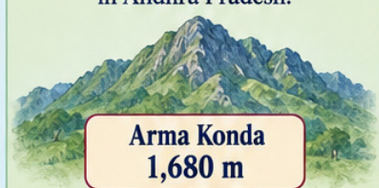
Eastern Ghats: Keep source-specific peak claims distinct.

NCERT Class IX names Mahendragiri, 1,501 m, as the highest peak in its account.



(NCERT Class IX)

The Zoological Survey of India's 2014 Eastern Ghats paper gives **Arma Konda, 1,680 m,** in Andhra Pradesh.



(ZSI, 2014)

These are different source descriptions, not two heights of the same mountain. Mahendragiri's 1,501 m is also stated by Odisha Tourism. For accurate revision, identify which source an examination follows; do not present Mahendragiri as an uncontested highest-point claim across all sources.

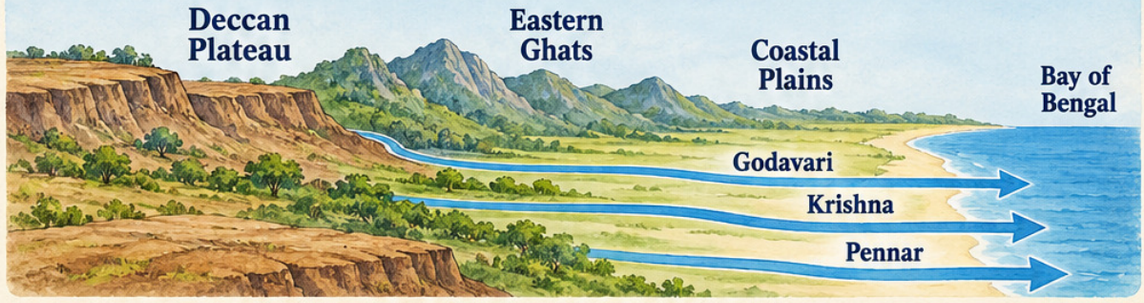
Conceptual diagrams; not to scale.

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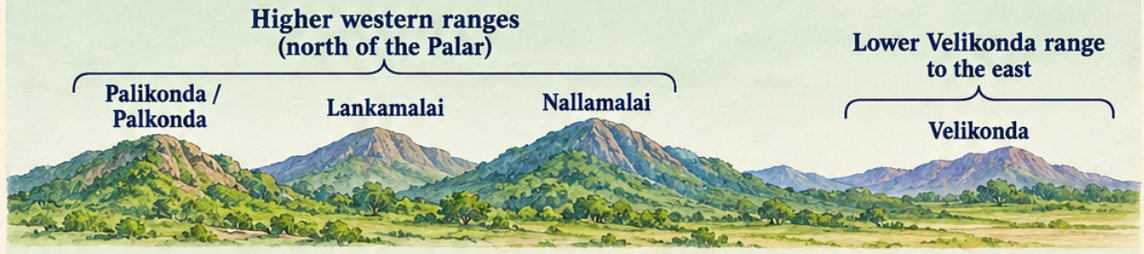
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DAY 22 | TOPIC 216 | Geography | Unit D-2 | 216.08

Andhra Pradesh: ranges, rivers and conservation

ANDHRA PRADESH'S THREE PHYSICAL ZONES: Coastal Plains, Eastern Ghats and Deccan Plateau. The Godavari, Krishna and Pennar flow towards the Bay of Bengal.



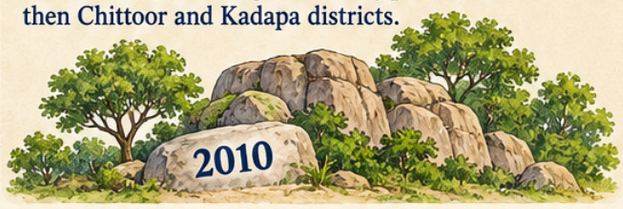
RANGE RELATIONSHIPS IN THE ZSI ACCOUNT (2014): north of the Palar, higher western ranges include Palikonda / Palkonda, Lankamalai and Nallamalai; the lower Velikonda range lies to the east.



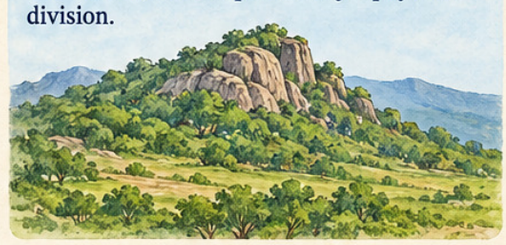
The same account describes Velikonda descending towards the coastal plains in northern Nellore district, and Nallamala continuing to the Krishna river. These district words are the source's historical descriptions, not a newly certified boundary map.

Other government profiles group the ridges differently. Learn the named ranges and river relationships rather than assuming one inner/outer-ridge grouping is universal.

SESHACHALAM BIOSPHERE RESERVE: designated in 2010 in Andhra Pradesh. The Union environment ministry describes Seshachalam hill ranges covering parts of the then Chittoor and Kadapa districts.



HORSLEY HILLS: an Eastern Ghats hill station near Madanapalle. It is a named upland destination, not a separate major physical division.



RIVER RECALL: the Godavari crosses the Papi hills in a gorge; the Penna leaves the Velikonda range near Somasila.



Compare range names, river crossings and ecological designations: they describe different but connected aspects of the landscape.



Conceptual diagrams; not to scale.

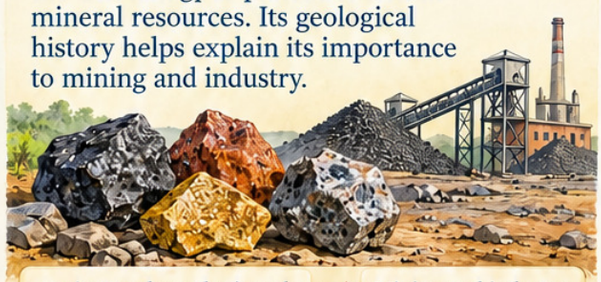
IAS WITH DR RAVI
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Why the plateau matters

ANCIENT ROCKS AND MINERALS

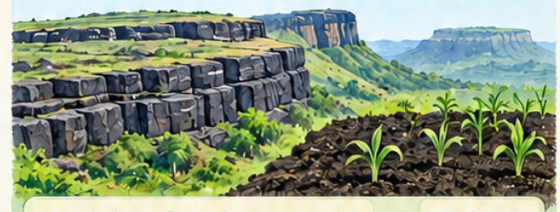
the Chotanagpur plateau is rich in mineral resources. Its geological history helps explain its importance to mining and industry.



Ancient rocks and minerals → Mining and industry

VOLCANIC ROCK AND SOIL

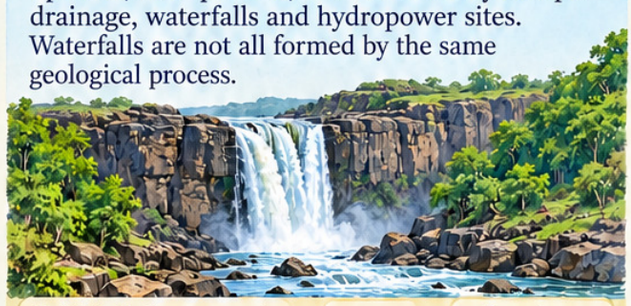
the Deccan Trap is associated with lava-derived igneous rocks and black soils in the western and north-western plateau.



Basalt (lava-derived igneous rocks) → Black soils

RELIEF AND RIVERS

uplands, escarpments, faults and valleys shape drainage, waterfalls and hydropower sites. Waterfalls are not all formed by the same geological process.



Relief (uplands, escarpments, faults and valleys) → Waterfall → Downstream hydropower sites

CLIMATE AND TRANSPORT

the Western Ghats force moist air to rise and concentrate road and rail links through gaps and passes.



Barrier (Western Ghats) → Pass or gap → Road and rail links

THREE WATERFALL–RIVER PAIRINGS

Jog / Gersoppa Falls → Sharavati → Karnataka

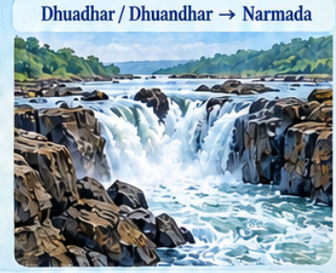


The supplied source gives a drop of 253 m and notes a hydropower project downstream.

Shivasamudram / Shivanasamudra → Kaveri



Dhuadhar / Dhuandhar → Narmada



The names are more useful than an unqualified “second biggest” ranking: waterfall rankings depend on what is measured, and should not be treated as universal without a criterion.

ECOLOGY

varied terrain supports distinct habitats, including the Seshachalam biosphere reserve.



REVISION CHAIN

rock structure → landform → drainage and soil → resources, movement and livelihoods. A good physical-geography answer explains the connections, not only a list of names.



Conceptual diagrams; not to scale.

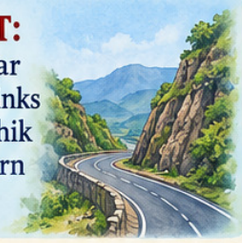
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Maharashtra passes: Thal is not Bhor

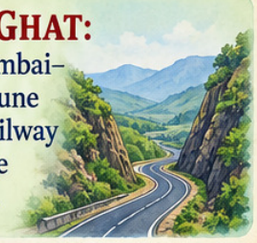
THAL / THUL GHAT:

a Western Ghats route near Kasara in Maharashtta. It links the Mumbai side with Nashik and routes towards northern and eastern India.



BHOR / BHORE GHAT:

the route from the Mumbai–Konkan side towards Pune and the Deccan. The railway connection runs via the Khandala ghat section.



THE SIMPLE DIRECTIONAL DISTINCTION:

Mumbai → Thal / Kasara → Nashik: broadly north-east.
Mumbai → Bhor / Khandala → Pune: broadly south-east.
These are route relationships, not a geographically scaled map.



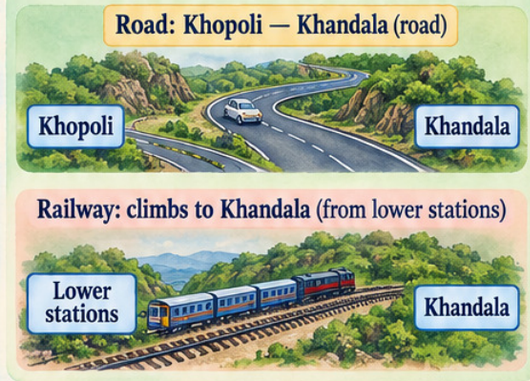
INDIAN RAILWAYS' HERITAGE ACCOUNT

describes the separate lines from Kalyan towards Kasara in the north-east and Khopoli in the south-east. The Bhor route joined the railways across the mountains to Pune.



ROAD AND RAIL WORDS

the Bhor road ghat is associated with Khopoli–Khandala; railway descriptions refer to the climb between the lower stations and Khandala. Do not assume a road segment and a rail segment must have identical endpoints.



REVISION RULE: both passes cross the Sahyadris, but their inland destinations differ. Thal → Nashik; Bhor → Pune.

Avoid relying on an old highway number alone: road numbering can change while the physical pass and its main route connection remain the same.

Conceptual diagrams; not to scale.

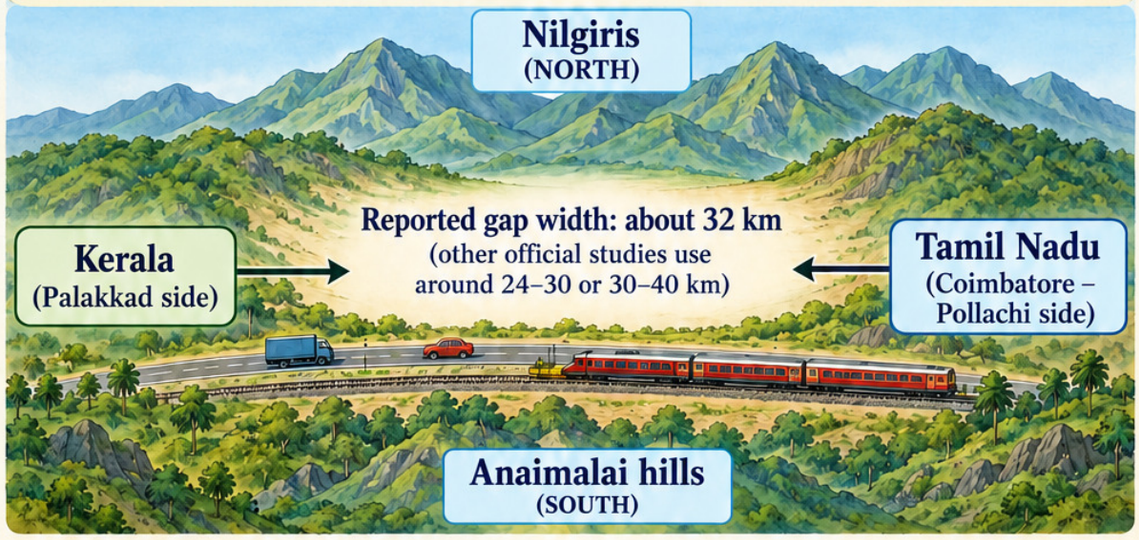
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Southern gaps: Palakkad and Shencottah

PALGHAT / PALAKKAD GAP:

- A broad break in the Western Ghats between Kerala and Tamil Nadu. Nilgiris lie to its north and Anaimalai hills to its south.
- It connects the Palakkad side with the Coimbatore–Pollachi side. Roads and railways use the gap.
- Kerala's official district survey describes it as about 32 km wide; other official studies use approximate widths around 24–30 or 30–40 km. Treat the width as approximate, not a precisely surveyed constant.



SHENCOTTAH / SENGOTTAI GAP, also called the ARYANKAVU PASS:

- Farther south, near the Kerala–Tamil Nadu border. Aryankavu lies in eastern Kollam district.
- Kerala's Revenue Department identifies NH 744 and the Punalur–Shenkottai broad-gauge railway through the pass.
- The route links the Kollam side with the Sengottai–Tenkasi side.



DO NOT EXCHANGE THE PAIRS: Palakkad → Coimbatore / Pollachi; between Nilgiris and Anaimalai.
Aryankavu / Shencottah → Kollam – Sengottai connection; farther south.

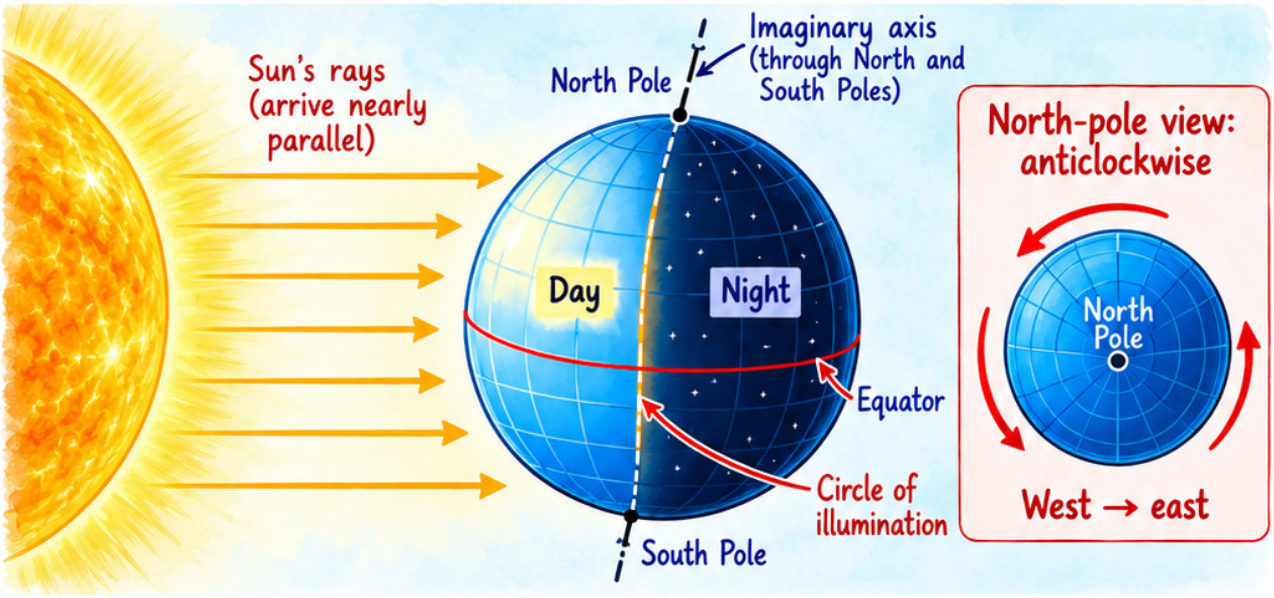
FINAL CHECK:

- General eastward plateau slope does not erase west-flowing rift rivers.
- Continuous Western Ghats do not mean there are no gaps.
- A hill-range relationship is not an administrative boundary.

Conceptual diagrams; not to scale.

Rotation: Earth turns from west to east

A spin on the axis — not a journey around the Sun

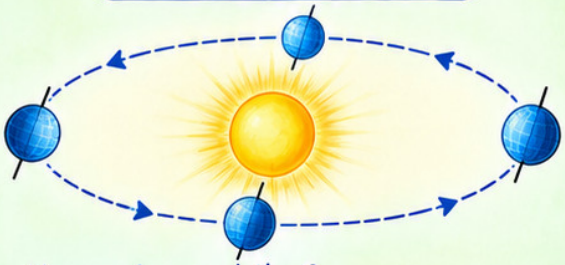


ROTATION



- Spin on its axis.
- About 24 hours for a mean solar day.
- Produces day and night.

REVOLUTION



- Movement around the Sun.
- About 365.2 days.
- Together with axial tilt, produces seasons.

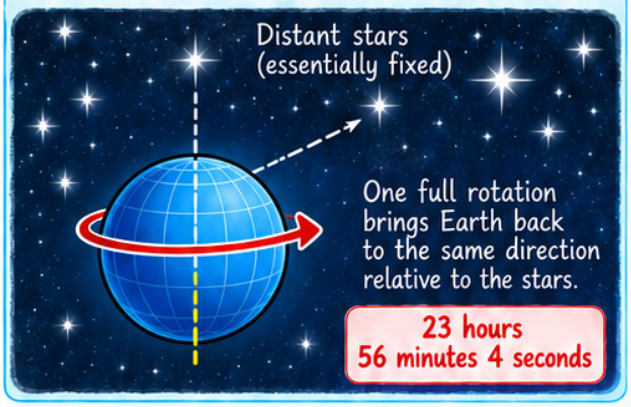
Earth turns eastward → the Sun appears to move westward across the sky.



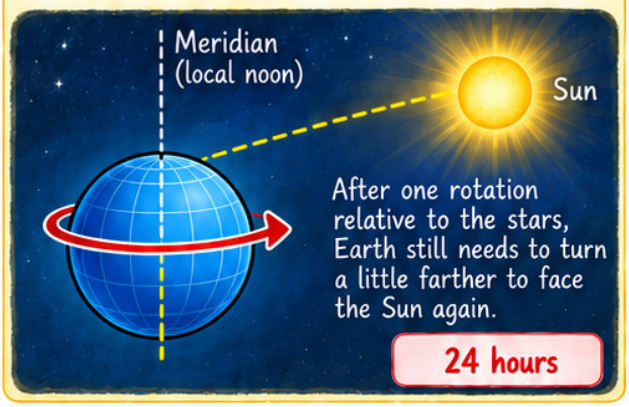
Rotation and revolution are different motions.

Two clocks for one turning Earth

Sidereal day: one rotation relative to distant stars — **23 hours 56 minutes 4 seconds.**



Mean solar day: average interval between successive solar transits of the same meridian — **24 hours.**





Why the extra rotation?

360° ÷ 365.2
≈ 1° of orbital advance per day

↓

About 1° extra rotation to face the Sun again

↓

About 4 extra minutes
(1° is 1/360 of a full rotation, so 24 h ÷ 360 ≈ 4 min per degree)

Comparison of the two days

Item	Sidereal day	Mean solar day
Reference	Distant stars	Sun (same meridian)
Period	23 hours 56 minutes 4 seconds	24 hours
What it measures	One rotation relative to stars	Average interval between successive solar transits of the same meridian
Length (rounded)	23 h 56 m 4 s (≈ 23.9345 h)	24 h (= 24.0000 h)

⚠ Important trap

24 hours is the mean solar day, not the sidereal rotation period.

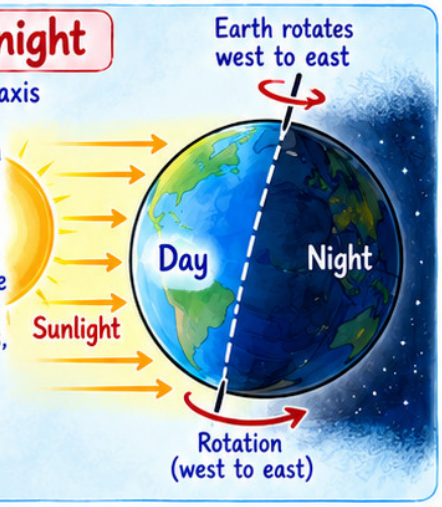
A sidereal day is shorter by about 4 minutes because Earth moves about 1° along its orbit each day and must turn a little farther to face the Sun again.

Rotation changes the sky, time and Earth's shape

1. Day and night

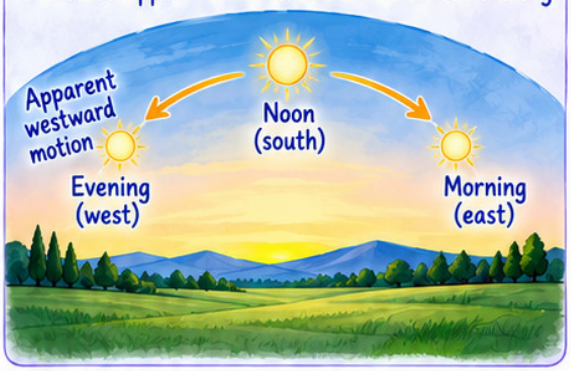
Earth rotates on its axis from west to east. Places facing the Sun have daylight, while places facing away have night.

Most places experience a daily sunrise and sunset. Near the poles, there are periods of continuous daylight (polar day) or continuous darkness (polar night).



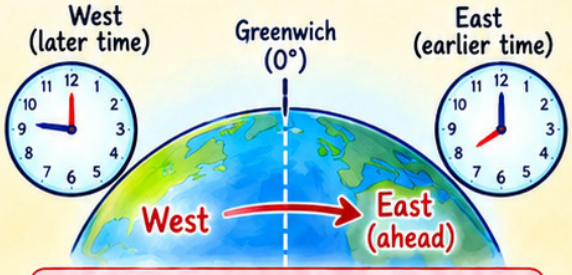
2. Apparent sky motion

Because Earth rotates eastward, the Sun, Moon and stars appear to move westward across the sky.



3. Local time

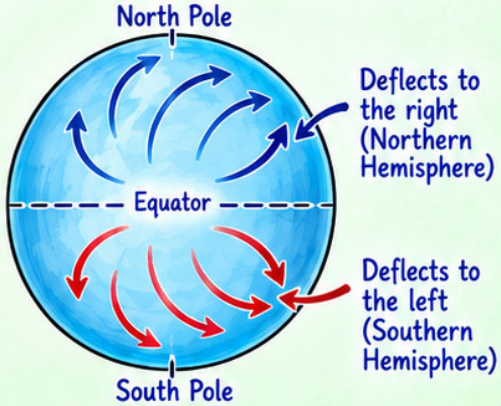
Earth rotates 360° in 24 hours.
So, 360° ÷ 24 hours = 15° per hour
= 1° per 4 minutes.
Places to the east experience local time earlier than places to the west.



15° per hour = 1° per 4 minutes

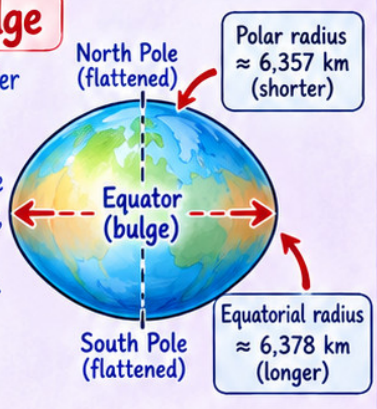
4. Coriolis effect

Due to Earth's rotation, moving air and water are deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.



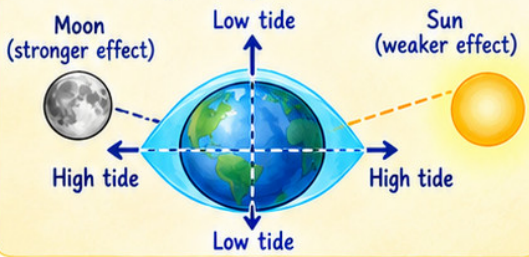
5. Equatorial bulge

Earth's rotation causes a wider equator and flatter poles. Centrifugal effect due to rotation reduces the effective pull of gravity at the equator, so the equatorial radius is larger than the polar radius.



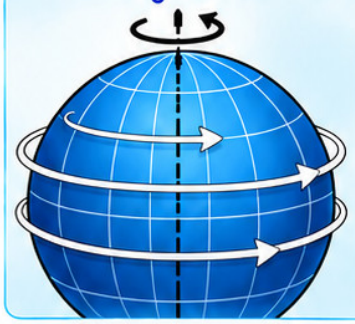
6. Tides

Tides are chiefly caused by the gravitational pull of the Moon and the Sun on Earth's oceans. They are not caused by Earth's rotation alone. Tidal friction gradually slows Earth's rotation.



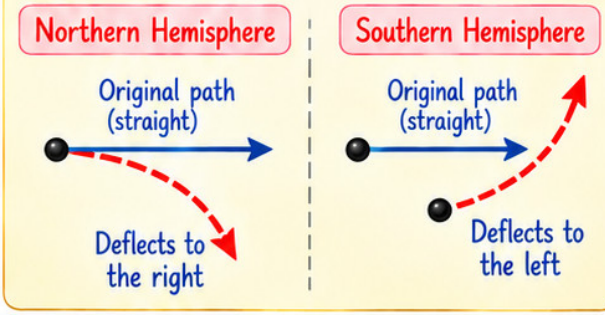
Rightward deflection does NOT mean a clockwise cyclone

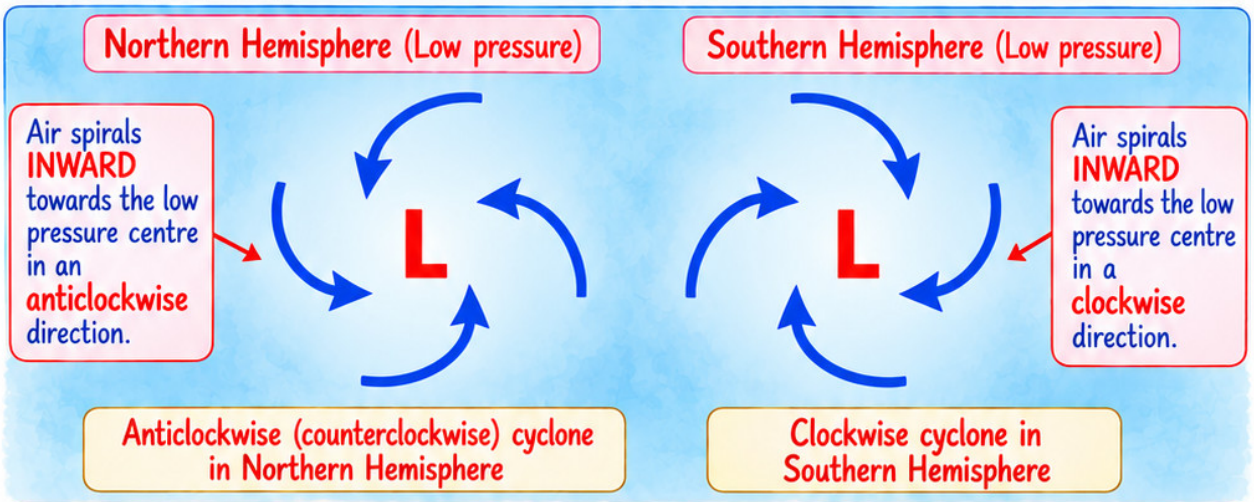
Coriolis effect is a apparent effect of viewing motion from rotating Earth.



Objects moving on Earth appear to deflect due to Earth's rotation (we are in a rotating frame of reference).

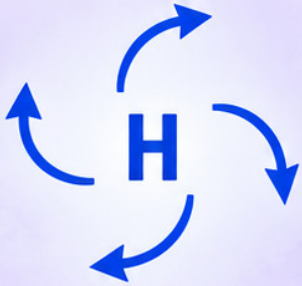
Deflection: right in the north; left in the south.





Inflow toward low pressure + Coriolis deflection → anticlockwise northern cyclones; clockwise southern cyclones.

Northern high pressure



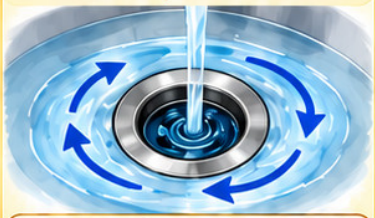
Northern high pressure: clockwise outward circulation.

Horizontal Coriolis effect is zero at the equator and strongest at the poles; it increases with moving-air speed.

Latitude dependence follows sin(latitude).

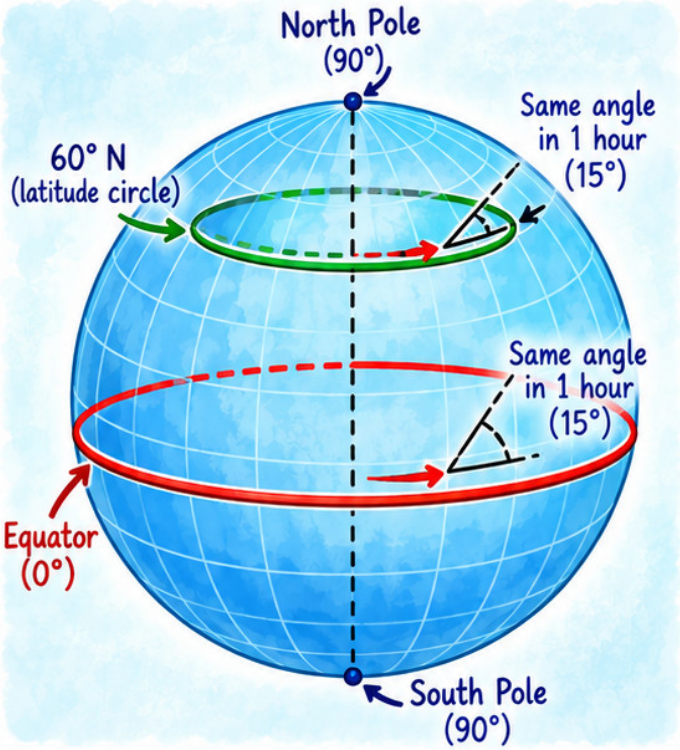
Tropical cyclones rarely form within 5° of the equator: Coriolis effect is too weak.

A sink drain is not a reliable hemisphere test.



Direction of water swirl in a sink depends on local conditions (shape, flow rate, obstruction), not on the hemisphere.

Same angular speed – different ground speeds



Angular speed: about 15° per hour everywhere.

The Earth rotates 360° in about 24 hours, so the angular speed is about 15° per hour at all latitudes.

Linear speed decreases toward the poles because latitude circles get smaller.

Everyone on Earth has the same angular speed, but the distance covered in 1 hour depends on the size of the latitude circle. The circle is largest at the equator and gets smaller toward the poles, so the ground (linear) speed decreases.

Formula for linear speed

$$v = 1{,}670 \times \cos(\text{latitude}) \text{ km/h}$$

(approximate)

Here, **1,670 km/h** is the linear speed at the equator. "latitude" is the absolute value in degrees (0° to 90°).

Worked examples

Latitude (°)	cos(latitude)	Linear speed (km/h)
0°	1	about 1,670 km/h
30°	0.866	about 1,446 km/h
45°	0.707	about 1,181 km/h
60°	0.5	about 835 km/h
90°	0	zero

Example

At 60°:

$1{,}670 \times 0.5 = 835$ km/h

So, the linear speed at 60° latitude is about 835 km/h.

Note

Equator travels about 40,075 km in about 24 hours.

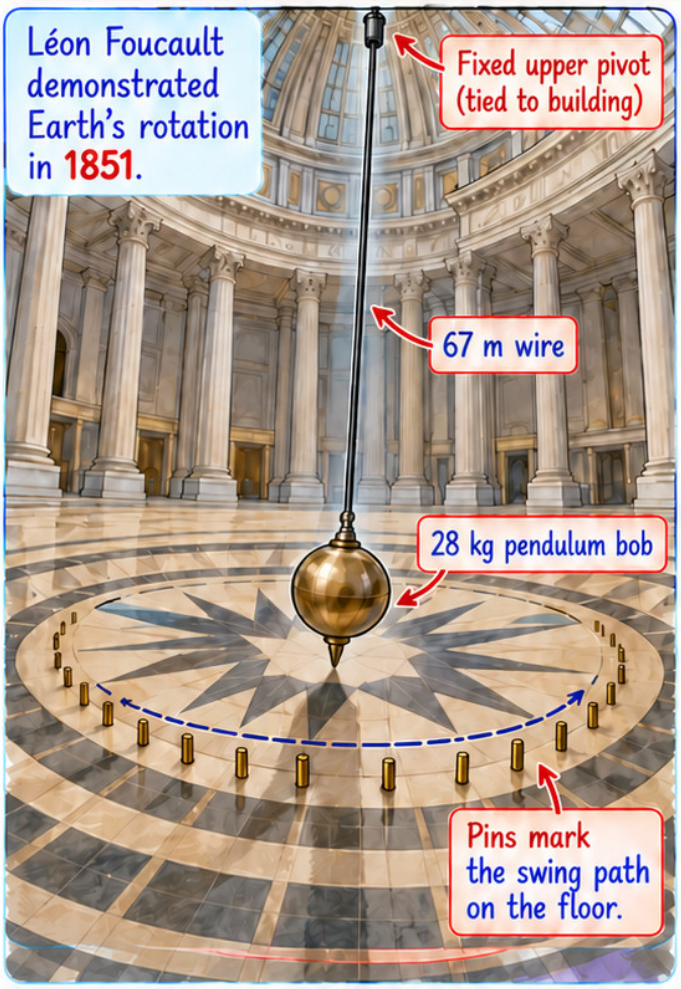
These speeds are rounded teaching approximations.

Trap

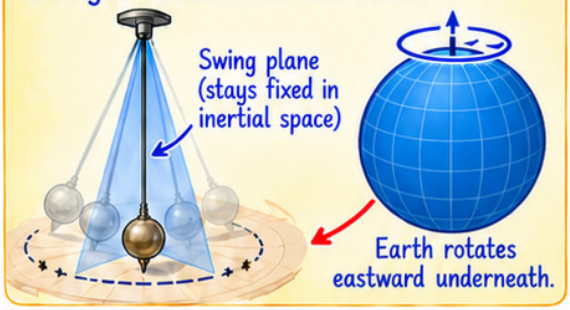
Use **cosine** for surface linear speed, not sine.

Foucault's pendulum: the floor turns beneath the swing

Léon Foucault demonstrated Earth's rotation in **1851**.

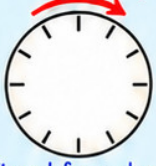


The swing plane stays approximately fixed in inertial space while Earth rotates underneath; its direction changes relative to the floor.



Relative to the floor:
clockwise in the Northern Hemisphere;
anticlockwise in the Southern Hemiisphere.

Northern Hemisphere



Viewed from above the local floor.
Clockwise precession of the swing plane (relative to the floor).

Southern Hemisphere



Viewed from above the local floor.
Anticlockwine precession of the swing plane (relative to the floor).

Precession rate = Earth's rotation rate × sin(latitude)

Pole: fastest
About one full turn per sidereal day.



Latitude = 90°
sin 90° = 1 → full rate

Paris: about one full turn in **32 hours**



Latitude ≈ 49°
sin 49° ≈ 0.75 → 24 / 0.75 ≈ 32 hours

Equator: no precession of the swing plane



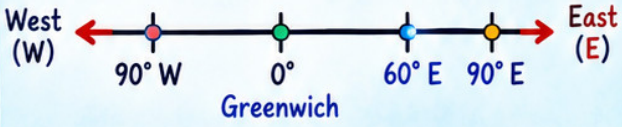
Latitude = 0°
sin 0° = 0 → no precession

Surface linear speed (due to Earth's rotation) uses **COSINE** of latitude.

Foucault precession (of the swing plane) uses **SINE** of latitude.

Longitude becomes time in four clear steps

Longitude tells us how far a place is east or west of the Prime Meridian (0°).



Key idea

As Earth rotates 360° in 24 hours, 15° of longitude corresponds to 1 hour and 1° corresponds to 4 minutes of local solar time.

360° in 24 hours → 15° in 1 hour → 1° in 4 minutes

EAST → AHEAD → ADD

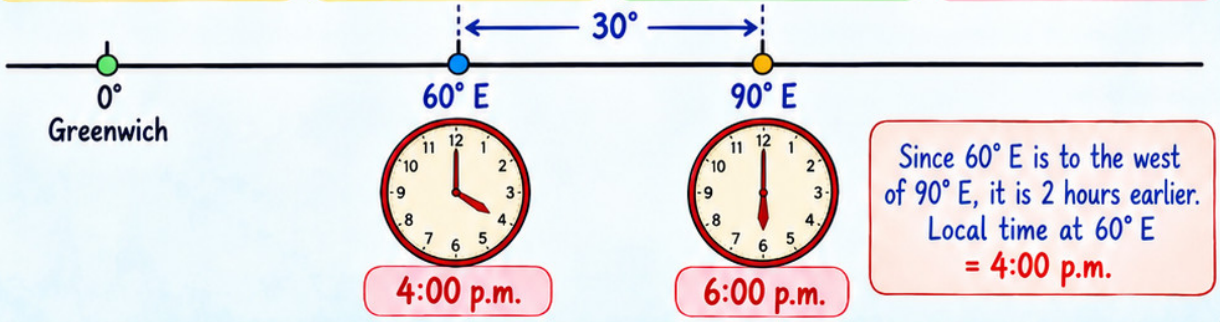
Places to the east have later local time. Add the time difference.

WEST → BEHIND → SUBTRACT

Places to the west have earlier local time. Subtract the time difference.

Example 1: At 90° E, local time is 6:00 p.m. Find local time at 60° E.

1. Same side of Greenwich: subtract longitudes.
2. 90° − 60° = 30°.
3. 30° × 4 minutes = 120 minutes = 2 hours.
4. 60° E is west of 90° E: subtract 2 hours → 4:00 p.m.



Since 60° E is to the west of 90° E, it is 2 hours earlier. Local time at 60° E = 4:00 p.m.

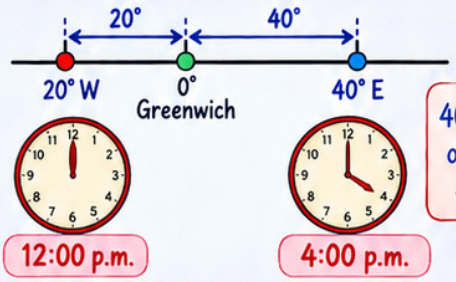
Example 2: Opposite sides of Greenwich

Find the time difference between 20° W and 40° E.

Separation = 20° + 40° = 60°.

Time difference = 60° × 4 minutes = 240 minutes = 4 hours.

The eastern place (40° E) is ahead by 4 hours.



40° E is ahead of 20° W by 4 hours.

These are local solar-time calculations, not political time-zone rules.

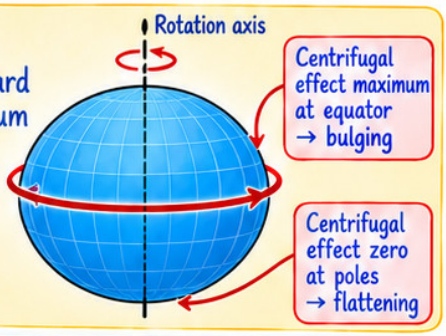
Indian Standard Time uses 82°30′ E.

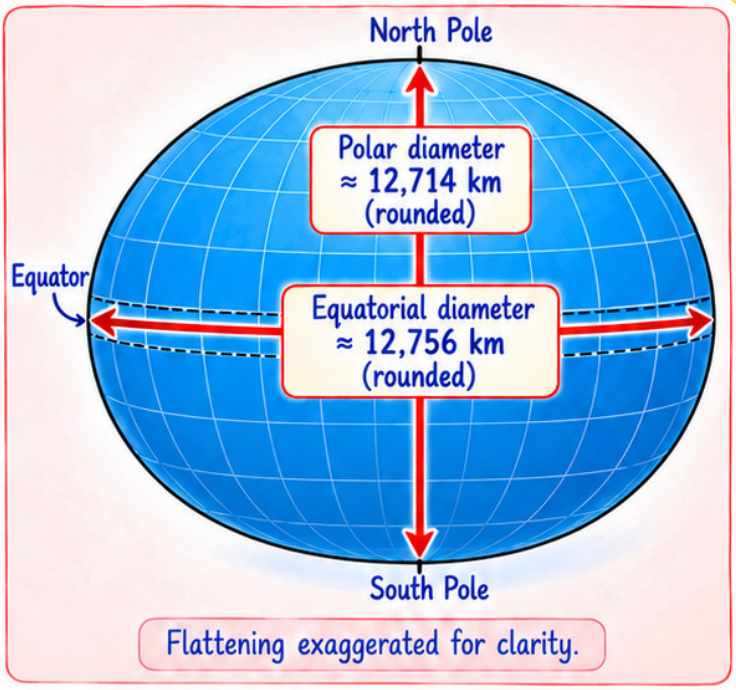
Why Earth's diameter is about 43 km larger at the equator

Earth is not a perfect sphere. It is an oblate sphere, slightly flattened at the poles and bulging at the equator due to its rotation.

Rotation causes bulging

As Earth rotates, the outward centrifugal effect is maximum at the equator and zero at the poles. This makes the equatorial region bulge and the polar region flatten.





Flattening exaggerated for clarity.

NASA source radii

NASA equatorial radius: **6,378.137 km**
NASA polar radius: **6,356.752 km**

Calculate the difference

Difference in radii = 6,378.137 − 6,356.752
= **21.385 km**

Difference in diameters = 2 × 21.385
= **42.77 km**

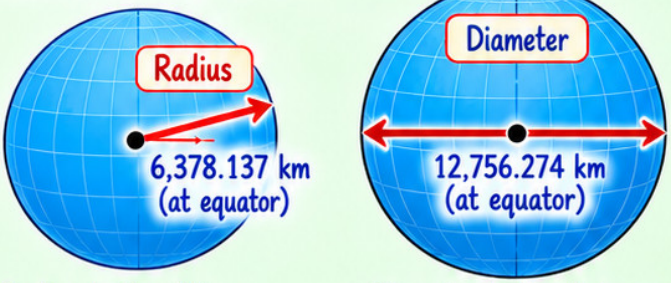
About 43 km.

Using rounded diameters

Rounded diameters:
Equatorial diameter: about **12,756 km**
Polar diameter: about **12,714 km.**

Subtracting rounded values gives 42 km; use exact source radii before rounding the final result.

Radius vs diameter



Radius is the distance from the centre to the surface.

Diameter is the distance across the Earth through the centre (2 × radius).

Flattening value

Flattening (f) describes how much Earth is flattened at the poles.

Flattening = 0.003353 ≈ 1/298

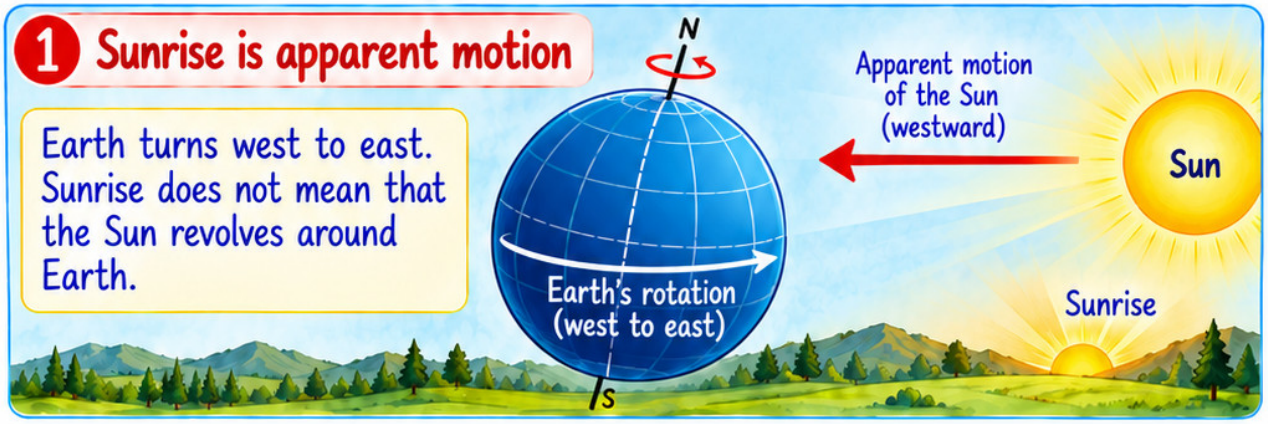
This small flattening value means Earth is very close to a sphere, but the equatorial bulge is large enough to make the diameter about 43 km greater at the equator.

Rotation contributes to equatorial bulging and polar flattening.

Three rotation traps — reason through the mechanism

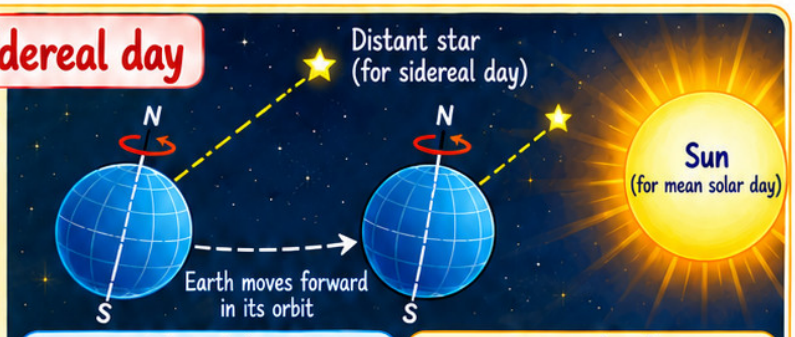
1 Sunrise is apparent motion

Earth turns west to east. Sunrise does not mean that the Sun revolves around Earth.



2 24 hours is not the sidereal day

Sidereal day: 23 h 56 min 4 s.
Mean solar day: 24 h.
Orbital advance requires a little extra turn to face the Sun again.



Sidereal day
23 h 56 min 4 s
(one rotation relative to distant stars)

Mean solar day
24 h
(successive returns of the Sun to the meridian)

3 Right deflection, anticlockwise cyclone

Air flows inward toward low pressure. Deflection is to each parcel's right, producing anticlockwise circulation in the north.

Air moves toward a LOW → Each parcel deflects to its own RIGHT in the north. → Together: ANTICLOCKWISE circulation

its own right

Comparison

- Northern low: anticlockwise
- Southern low: clockwise

Direction → reference frame → mechanism • understand these • before memorising a diagram.

Cropping seasons: the agricultural calendar

Day 24 | Topic 236 | 236.01

KHARIF:

Sown with the onset of the monsoon; harvested in September–October.



RABI:

Sown October–December; harvested April–June.



ZAID:

Short summer season between rabi and kharif.



Two textbook lenses—not a contradiction

Textbook lens	What it shows	Details
Class X	Sowing and harvesting windows	Gives month-wise sowing and harvesting periods for major crops.
Class XII	Season bands	**Kharif:** June – September **Rabi:** October – March **Zaid:** April – June

Regional flexibility: adequate soil moisture can support two or three rice crops in West Bengal and southern States. These are broad seasonal guides, not one rigid calendar for every region.





Sugarcane takes almost a year: do not force it into one short season.

Source: supplied Day 24 notes; NCERT Class X Agriculture and Class XII Land Resources and Agriculture.

How crops share a field

Day 24 | Topic 236 | 236.02

Crop key: Maize (tall crop) Soybean (low crop)

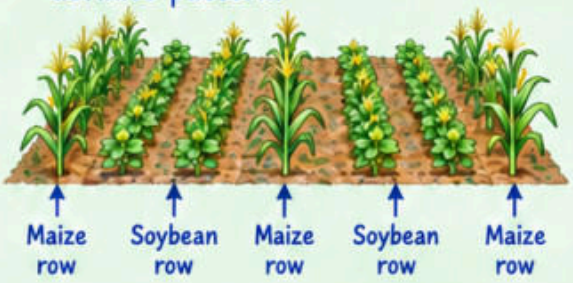
1. Mixed cropping

Two or more crops grow together without a fixed row arrangement.



2. Intercropping

Crops grow simultaneously in a definite pattern.



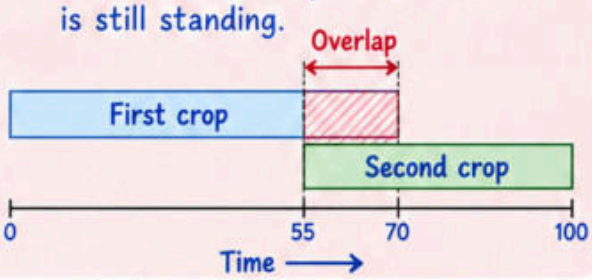
3. Sequential cropping

The next crop is planted after harvesting the preceding crop.



4. Relay cropping

Sow the next crop while the first is still standing.



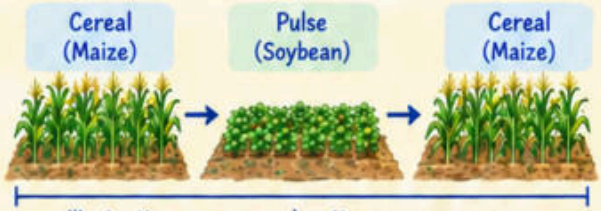
5. Double cropping

Two successive crops on the same land in one agricultural year.



6. Crop rotation

Different crops follow a planned sequence on the same field.





Timing tells them apart: simultaneous / overlapping / successive.

Double cropping counts crops per year. Rotation asks which different crops follow in what order. Two rice crops can be double cropping without being a cereal–pulse rotation.

Sources: supplied Day24 notes; NCERT Class IX Exemplar; TNAU cultivation practices.

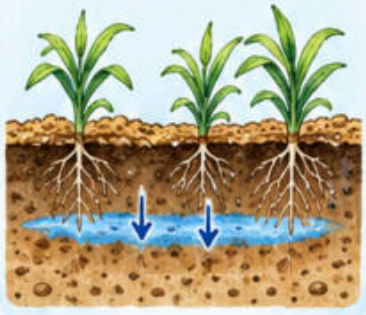
Water decides the farming strategy

Day 24 | Topic 236 | 236.03

Source of moisture

Irrigated farming

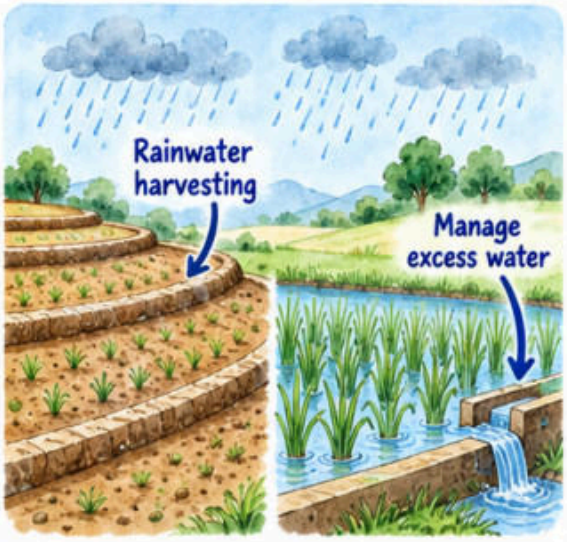
Protective irrigation: reduces harm from soil-moisture deficiency.



Productive irrigation: supplies adequate moisture during the cropping season for high productivity.



Rainfed (barani) farming



Aspect	Dryland farming	Wetland farming
Rainfall condition	Largely in areas receiving less than 75 cm annual rainfall (NCERT classsification).	Rainfall exceeds plants' soil-moisture requirements in the rainy season.
Crops	Crops: ragi, bajra, moong, gram, guar.	Crops: rice, jute, sugarcane; freshwater aquaculture also occurs.
Key focus / Priorities	Priorities: conserve soil moisture and harvest rainwater.	—
Risks / Concerns	—	Risks: flooding and soil erosion.

Key takeaway: Rainfed does not mean dryland only. It includes both dryland and wetland farming.

Source: NCERT Class XII: Land Resources and Agriculture; supplied Day24 notes.

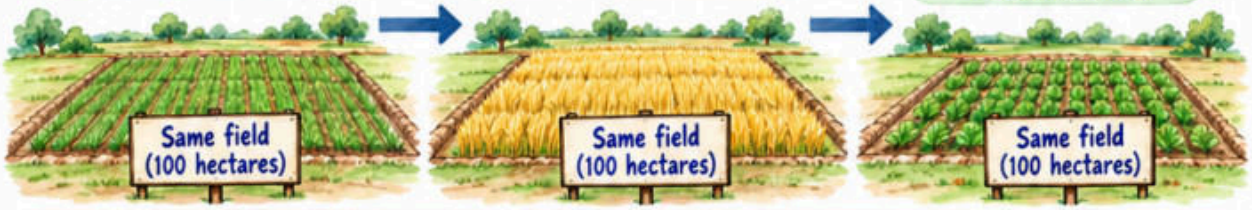
One field, several sowings: measure intensity

Day 24 | Topic 236 | 236.04

Kharif: 100 hectares

Rabi: the same 100 hectares

Zaid: 50 hectares of the same land



Illustrative example—not observed data.

Net sown area (NSA): physical land sown, counted once during the year.

Gross cropped area (GCA): sum of crop areas across sowings; land can be counted more than once.

Worked calculation (illustrative example)

NSA	=	100 hectares
GCA	=	100 + 100 + 50 = 250 hectares
Cropping intensity	=	GCA ÷ NSA × 100 = 250%
Area sown more than once	=	GCA − NSA = 150 hectares

The 150 hectares is extra crop-area accounting, not 150 additional hectares of physical land.

Same field, different sowings (conceptual view)



Takeaway: Intensity measures repeated use of cultivated land, not yield per hectare. For positive NSA it is at least 100%.

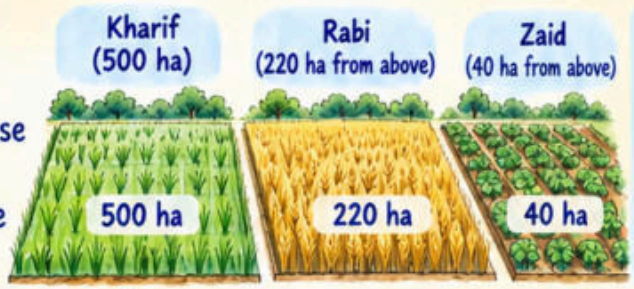
Source: NCERT Class XII; supplied Day24 notes. Example constructed for teaching.

More cropped area can mean lower intensity

Day24 | Topic236 | 236.05

Base case

500 hectares sown in kharif; 220 of these sown again in rabi; 40 sown a third time in zaid.

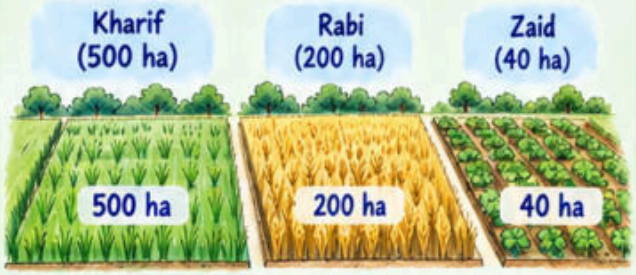


Net sown area (NSA) = 500 ha
Gross cropped area (GCA) = 500 + 220 + 40 = **760 ha**

Cropping intensity = 760 ÷ 500 × 100 = **152%**

Scenario A: less repeated sowing

20 ha of rabi land left fallow.
NSA stays 500 ha.

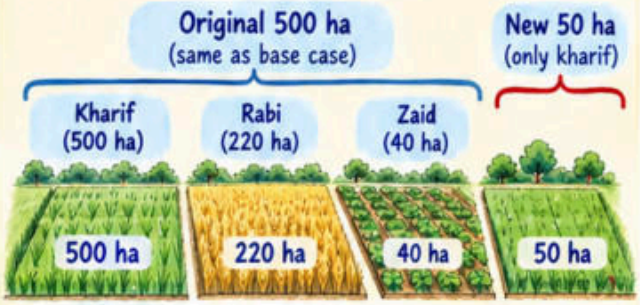


Net sown area (NSA) = 500 ha
Gross cropped area (GCA) = 500 + 200 + 40 = 740 ha

Cropping intensity = 740 ÷ 500 × 100 = **148%**

Scenario B: add once-sown land

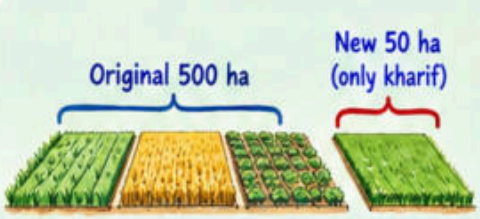
Add 50 new hectares, sown only in kharif.
NSA = 550 ha.



Net sown area (NSA) = 550 ha
Gross cropped area (GCA) = 500 + 220 + 40 + 50 = 810 ha

Cropping intensity = 810 ÷ 550 × 100 ≈ **147.3%**

GCA rises: 760 → 810 ha. Intensity falls: 152% → about 147.3%.



The denominator rises too. New land carrying one crop can lower the average number of sowings, even when total crop area increases.

Mini Check

Always compare GCA with NSA—not GCA alone.



Illustrative village – not actual statistics.
Source: Supplied Day24 worked examples; calculations independently checked.

How India's crop-area pattern changed

Day24 | Topic236 | 236.06

Gross area under major crops—million hectares

Crop	1960–61	2000–01	2022–23
 Rice	34.1	44.7	47.8
 Wheat	12.9	25.7	31.4
 Coarse cereals	45.0	30.3	24.1
 Pulses	23.6	20.3	28.9
 All foodgrains	115.6	121.0	132.2
 Oilseeds	13.8	22.8	30.2
 Cotton	7.6	8.6	12.9
 Sugarcane	2.4	4.3	5.9

Important note: Historical comparison—not current-year estimates. Coarse cereals for 1960–61 and 2000–01 are derived as cereals minus rice and wheat in the supplied source pack.

From the table: key inferences



Wheat
12.9 → 31.4
more than doubled.



Coarse cereals
45.0 → 24.1
area contracted.



Pulses
23.6 → 20.3 → 28.9
first declined, then recovered above the starting level.

- Do not infer that every crop other than rice and wheat lost area. Oilseeds, cotton and sugarcane also gained.
- Area is not production: output also depends on yield.

Sources: Supplied Day24 source table; Economic Survey 2006–07 Table 1.13 and 2023–24 Table 1.16. Retain these historical vintages.

Read cropping intensity with its year

Day24 | Topic236 | 236.07



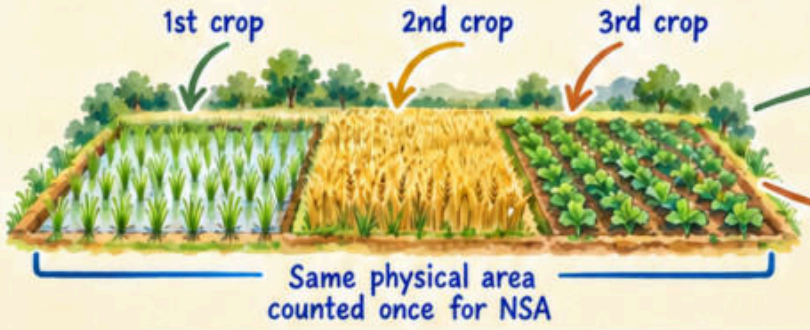
All India—Land Use Statistics

Year	Cropping intensity
2021–22	155.4%
2022–23	155.9%
2023–24 (provisional)	156.8%

155.9% refers to 2022–23. The newer 2023–24 observation is 156.8% and is provisional. Always keep the year and estimate status with the figure.

2023–24 (provisional); thousand hectares

Net area sown	138992
Gross cropped area	217882
Area sown more than once	78890



Count physical area once → **NSA** (Net area sown)

Count each sowing → **GCA** (Gross cropped area)

Cropping intensity = GCA ÷ NSA × 100



Use the publication's reported 156.8%. Do not label a provisional observation final. This is land-use intensity, not crop yield.

Source: DA&FW, Land Use Statistics at a Glance 2023–24, Table III and All-India land-use series. Verified 31 October 2026.

Why farmers change the crop mix

Day24 | Topic236 | 236.08

Rainfall and soil moisture



Amount, timing and distribution of rainfall determine soil moisture and the feasibility of different crops.

Irrigation



Irrigation provides assured water and reduces risk, allowing farmers to choose water-intensive or higher-value crops.

Technology



Better seeds, improved practices and other technology raise yields and change the relative attractiveness of crops.

Prices and assured buyers



Higher prices and assured procurement encourage farmers to expand area under crops with better market returns.



Crop choice and area allocation



Economic Survey 2025–26: incentives matter

Maize cultivated area grew at 6.68% CAGR between FY22 and FY25. The expected reduction in paddy acreage did not materialise.

Price signal → **Relative profitability** → **Land, water and labour allocation**

Higher expected prices improve relative profitability, which influences how farmers allocate their land, water and labour across crops.

Irrigation coverage: 55.8%

of gross cropped area in 2022–23, as cited in the Survey.

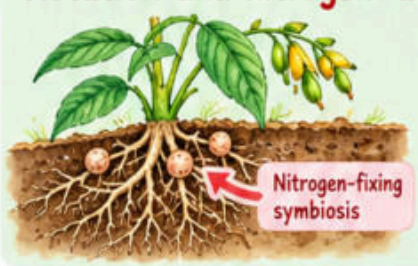


This shows the extent of irrigation in 2022–23, based on the Economic Survey 2025–26. Keep this historical year; it is not a 2026 estimate.

Caution: Growth in one crop does not prove an equivalent fall in paddy. Farmers may shift land from several other crops.



Rotation and nitrogen: avoid a textbook trap



NCERT Class X wording excludes arhar in one sentence. Scientifically, arhar (pigeon pea) is a legume and can fix atmospheric nitrogen; field research supports this. Do not turn a textbook wording issue into a biological rule.

Cropping pattern =

what is grown, where, when and in what share— not merely a list of seasons.



Sources: Economic Survey 2025–26 Ch 6; supplied Day24 notes; ICRISAT Rao et al. (1987) research cited in source pack.

Paddy can repeat; the meanings must not

Day24 | Topic236 | 236.09

Mono-cropping:
a single crop grown on the field.



Kharif (Year 1) | Rabi | Summer

Rice → Rice → Rice

Multiple cropping:
two or more crops on the same land in one agricultural year.



Illustrative sequence

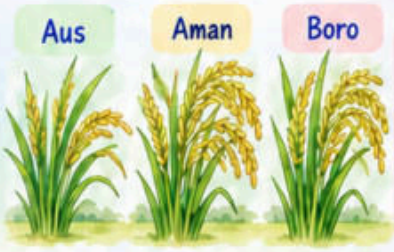
Season1 → Season2 → Season3

Paddy | Pulses (or other crop) | Paddy



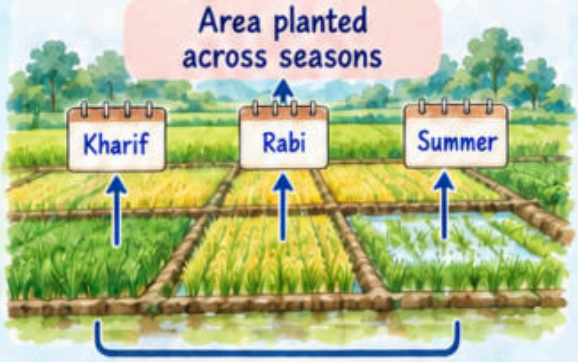
Rice → Rice can be double cropping.

Repeating the same crop is not the same as a planned rotation of different crops.



Aus, aman and boro:
NCERT names three paddy crops in Assam, West Bengal and Odisha. Regional calendars vary.

Andhra Pradesh: read the official area series



Year	Total cropped area (thousand hectares)
2018–19	7297
2019–20	7287
2020–21	7407
2021–22	7328

Source: Ministry of Agriculture, Lok Sabha reply 1254, PIB 30 July 2024, Annexurel.
Historical series—not present-day area.

Total cropped area counts all crop sowings in a year, across seasons, on the same land. → ⊗ Do not call gross cropped area net sown area.



Three checks before answering

1. Same time, overlap, or succession?
2. Physical land or repeated sowings?
3. Which reference year and estimate status?

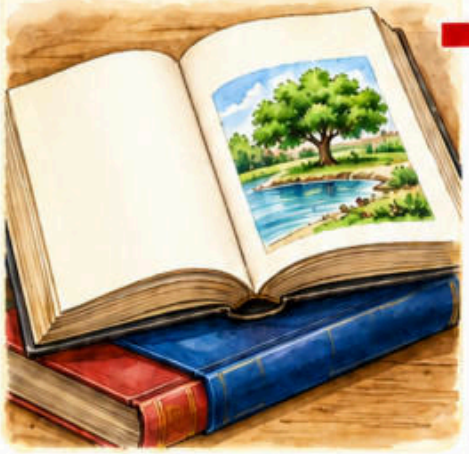
Source: SuppliedDay24 notes; NCERT; PIB 30 July 2024.

Literacy: first fix the denominator.

Census literacy age 7+: read AND write WITH understanding in any language. Reading alone is insufficient.

1. READ

Read a book in any language with comprehension.



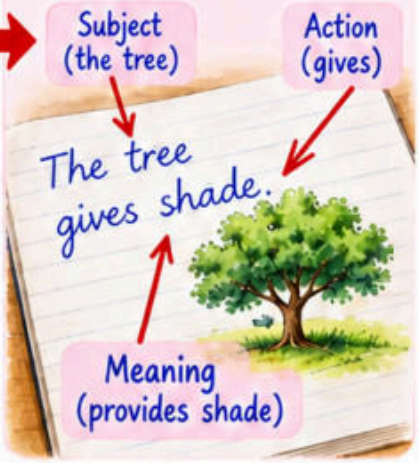
2. WRITE

Write with a pen in any language.



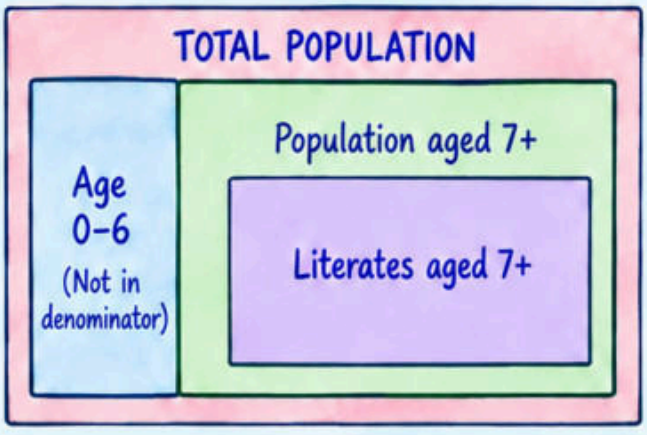
3. UNDERSTAND

Understand the meaning of what is read and written.



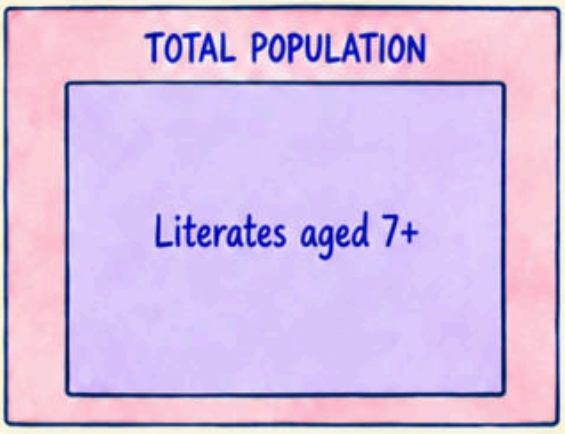
EFFECTIVE LITERACY RATE (AGE 7+)

$$\text{Effective literacy rate} = \frac{\text{Literates aged 7+}}{\text{Population aged 7+}} \times 100$$



CRUDE LITERACY RATE (ALL AGES)

$$\text{Crude literacy rate} = \frac{\text{Literates}}{\text{Total population}} \times 100$$



EXAM CUE: Same numerator, different denominator.

Source: Census 2011 definition; MoSPI.

One town, two correct rates.

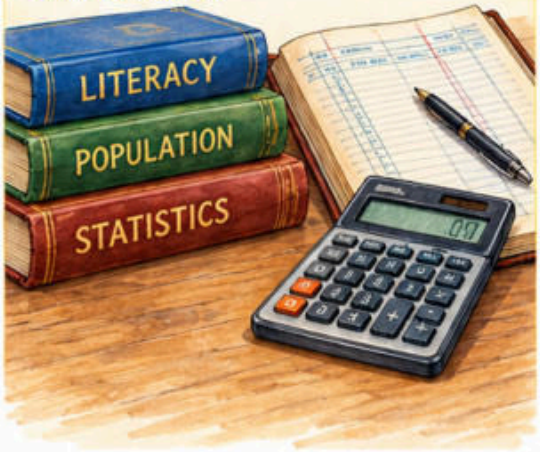
Hypothetical town data

Total population:	100,000
Children aged 0–6:	12,000
Population aged 7+:	88,000
Literates:	66,000



What are we finding?

Literacy rate can be calculated using two different denominators for the same town, giving two correct rates.



Step 1: Find population aged 7+

Subtract children (0–6) from total population.

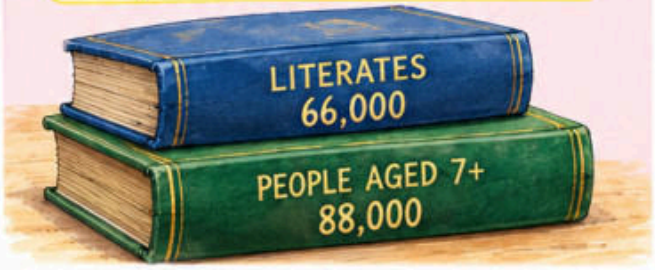
Total population 100,000 − Children aged 0–6 12,000 → Population aged 7+ 88,000

100,000 − 12,000 = 88,000

Effective literacy rate

Uses population aged 7+ as denominator because literacy is measured for people aged 7 and above.

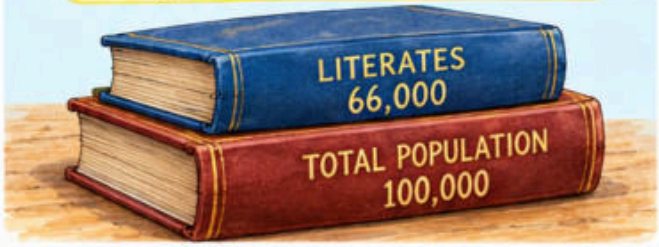
$$\frac{66,000}{88,000} \times 100 = 75\%$$



Crude literacy rate

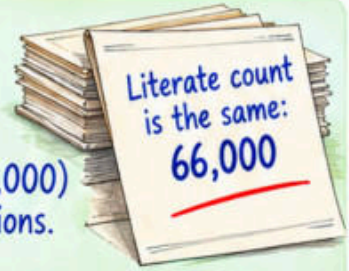
Uses total population as denominator because it includes everyone, including children aged 0–6 who are generally not yet literate.

$$\frac{66,000}{100,000} \times 100 = 66\%$$



Key point

The denominator changes, not the literate count. The number of literates (66,000) is the same in both calculations.



Comparison

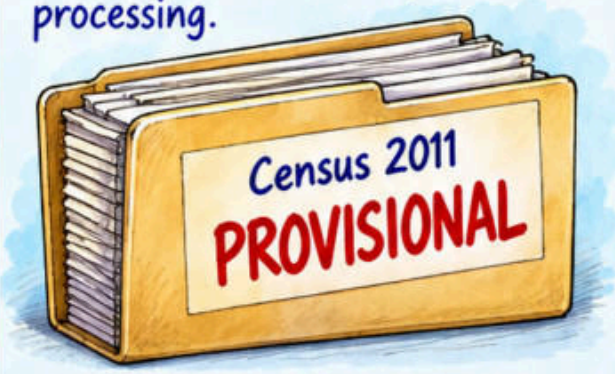
- Crude literacy rate cannot exceed effective literacy rate.
- It is lower here because children aged 0–6 are included in the denominator, which increases the total population but does not change the literate count.

Note This is a hypothetical worked example, not an official town dataset.

Census2011: provisional is not final.

Census2011 PROVISIONAL

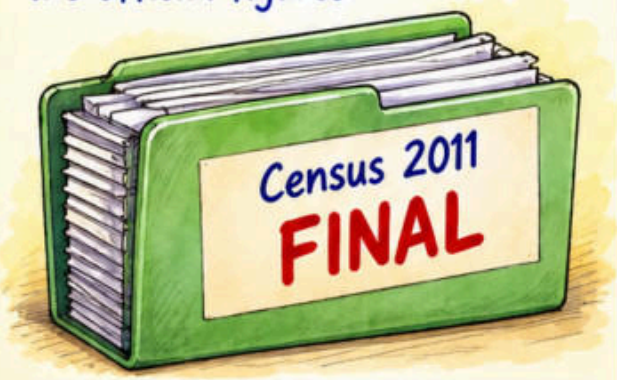
Provisional results were released earlier. These are not final and can change after complete processing.



Group	Literacy rate (%)
All	74.04%
Male	82.14%
Female	65.46%

Census 2011 FINAL

Final results were released after complete processing. These are the official figures.



Group	Literacy rate (%)
All	73.0%
Male	80.9%
Female	64.6%

Provisional gender gap

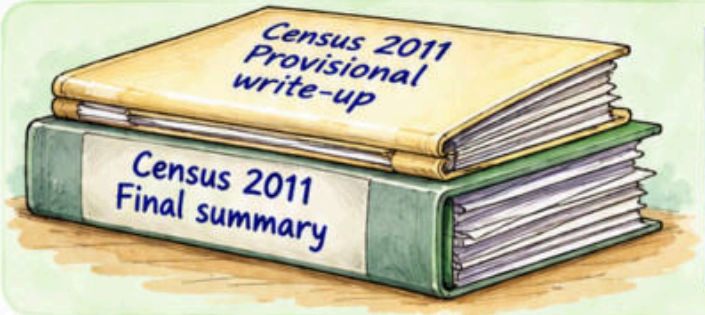
82.14 – 65.46 = 16.68

percentage points.

Final gender gap

80.9 – 64.6 = 16.3

percentage points.



Source:

MoSPI provisional write-up; PIB 11 July 2025 final Census summary.

Regional variation is not a simple north–south divide.

Census 2011 final rates, age 7+.

Highest rates (selected)

1. **Kerala** 94.0% (State)
2. **Lakshadweep** 91.8% (UT)
3. **Mizoram** 91.3% (State)

Lower rates (selected)

1. **Bihar** 61.8%
2. **Arunachal Pradesh** 65.4%
3. **Rajasthan** 66.1%
4. **Jharkhand** 66.4%

COMPARE:

North-east includes both Mizoram 91.3% and Arunachal Pradesh 65.4%.

Mizoram 91.3%
Arunachal Pradesh 65.4%

South includes Kerala 94.0% and undivided Andhra Pradesh 67.0%.

Kerala 94.0%
undivided Andhra Pradesh 67.0%

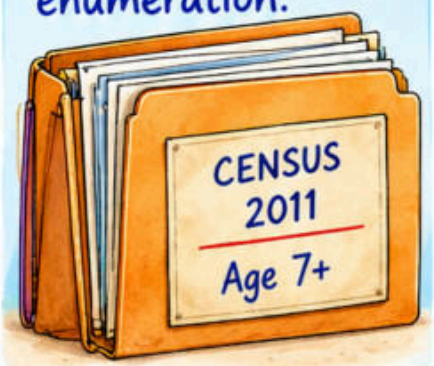
2011 boundaries

Census 2011 final rates, age 7+.
Historical not current ranking.

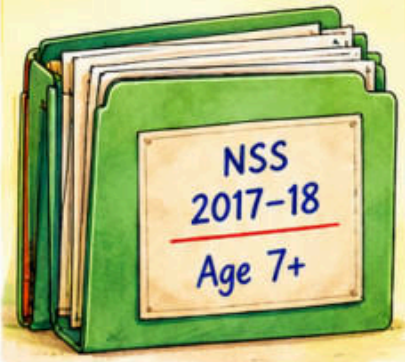
Source:
Economic Survey 2021–22
Statistical Appendix Table 8.5.

Census and surveys answer different questions.

CENSUS2011
Final: 73.0%
Complete enumeration.



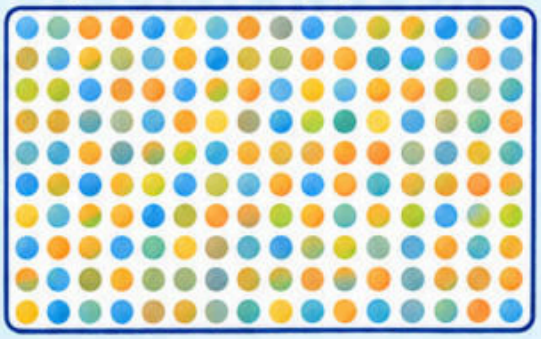
NSS2017-18
Final: 77.7%
Sample survey.



PLFS2023-24
Final: 80.9%
Sample survey.



ENUMERATION
Complete enumeration counts every unit in the population.



SAMPLE
A sample survey studies only a small number of units.



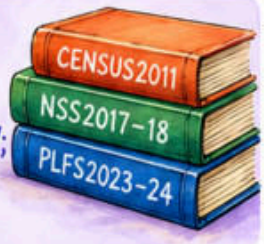
COMPARE: Survey results (Age 7+)

Survey	Rural	Urban	Male	Female
NSS2017-18	73.5%	87.7%	84.7%	70.3%
PLFS2023-24	77.5%	88.9%	87.2%	74.6%

EXAM CUE:
Check year, age group, method and geography before comparing.



SOURCE:
NSO Report585;
PLFS2023-24 Table7;
Census2011.



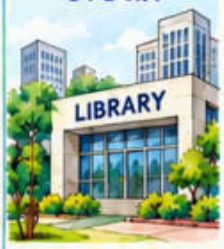
The later update: PLFS2025

PIB factsheet, 29September2026

Overall literacy rate

PLFS2023-24 (NSO Table 7; age 7+)	PLFS2025 (PIB, 29September2026; age7+)
80.9%	81.1%

Literacy rate, age 7+ (PLFS2025)

Overall	Rural	Urban
		
81.1%	77.4%	89%

Rural-Urban by gender (age7+; PLFS2025)

Group	Literacy rate
Rural male	84.8%
Rural female	70.3%
Urban male	93.1%
Urban female	84.8%

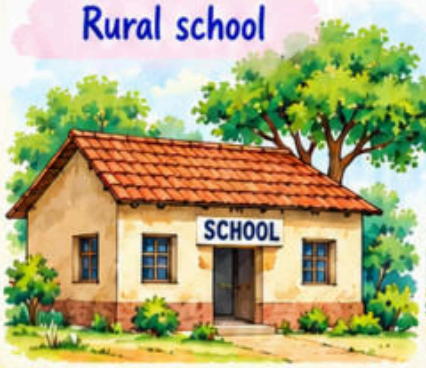
How were the estimates obtained?

PLFS stands for Periodic Labour Force Survey. It is a sample survey of households conducted across rural and urban areas to estimate literacy rate and other indicators.

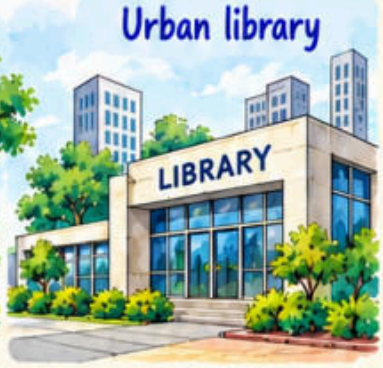


Rural and urban learning spaces

Rural school



Urban library



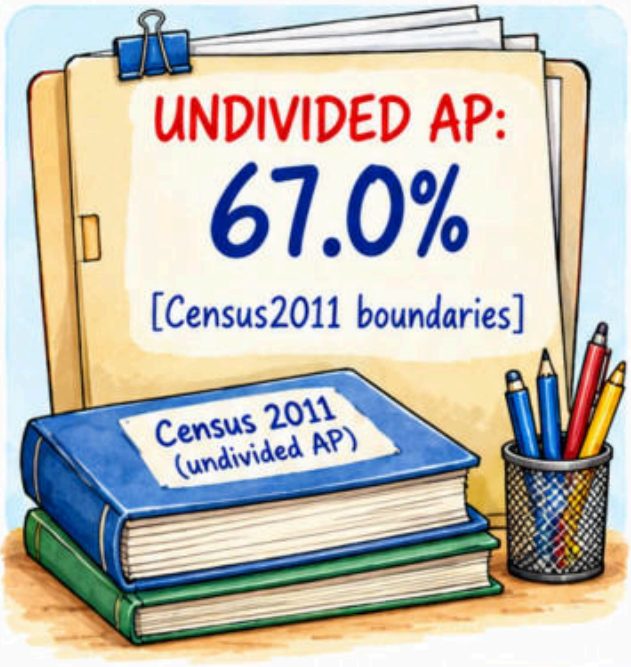
Important to note

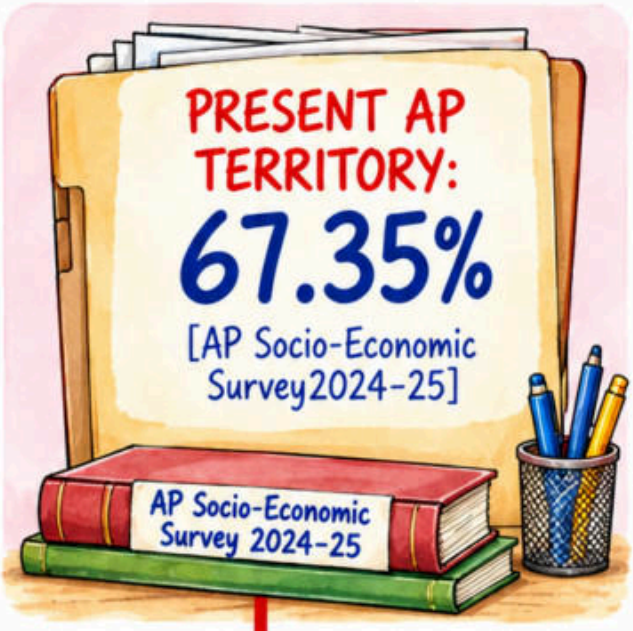
- These are PIB-reported PLFS2025 estimates, **not** Census2027 results.
- The figures are estimates from a sample survey (PLFS) and may differ from upcoming Census2027 results.

Source and limitation

Linked PLFS2025 report not independently retrieved; figures attributed to PIB.

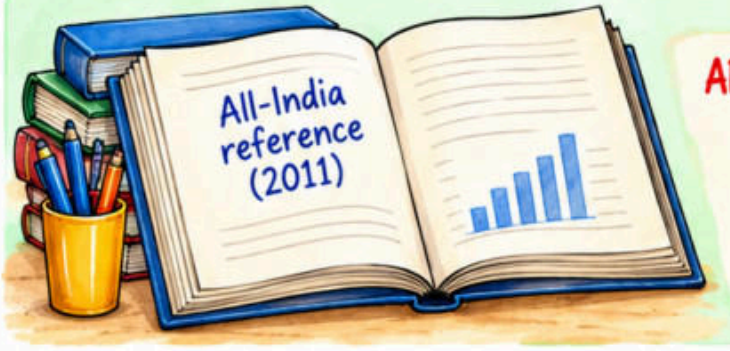
Two Andhra Pradesh baselines: do not swap them.





Comparison 2001 → 2011
(for present AP territory)

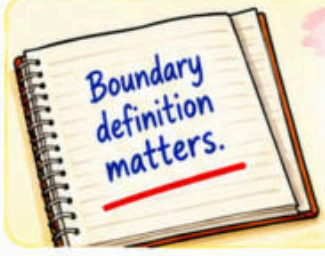
	2001		2011
Overall	62.07%	→	67.35%
Female	52.72%	→	59.96%



AP survey's 2011 all-India reference:

72.98%

these are historical rates, NOT 2026 estimates.



Important:
Boundary definition belongs beside every rate.



Sources:
- Economic Survey2021-22 Table8.5.
- AP SES2024-25 printedpage1.

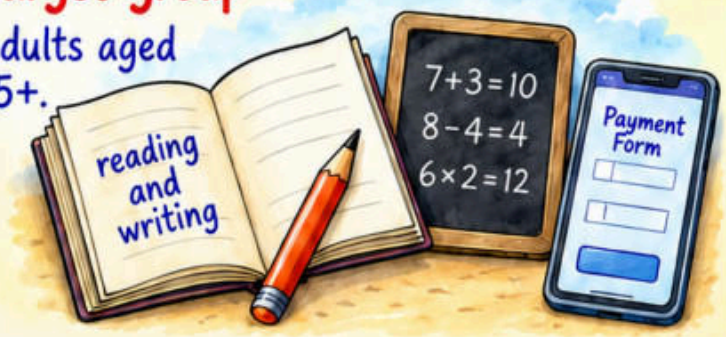
ULLAS: functional literacy, not a 100% claim

Scheme 2022-27

ULLAS (Understanding of Lifelong Learning for All in Society) is a national scheme for functional literacy.

Target group

Adults aged 15+.



Learning for everyday life

reading and writing → numeracy → useful life skills

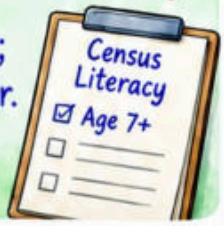
Programme benchmark

95% among age 15+ for full functional literacy.



Compare with Census literacy

Census literacy: age 7+; different age denominator.



Assessment flow

Learning



basic reading, writing and numeracy, and life skills.

FLNAT



Foundational Literacy and Numeracy Assessment Test.

Evaluation



based on assessment results.

Certification



given to those who meet the required standards.

Participation alone is not certification.

Key point

Full literacy declaration does **NOT** mean 100% Census literacy.

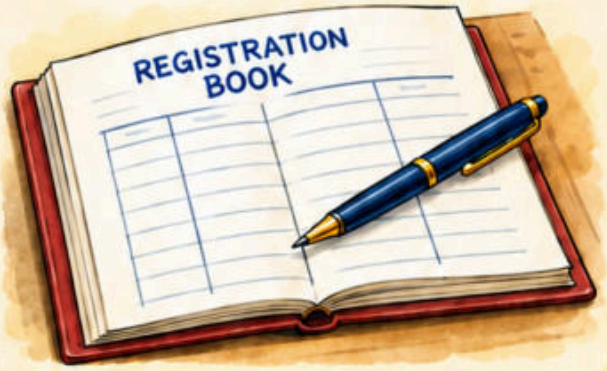
95% among age 15+ (functional literacy) ≠ **100%** Census literacy (age 7+)

Source: Ministry of Education/PIB 23 June 2025; PIB 29 September 2026.

ULLAS: read the progress counters correctly.

Dated snapshot 29 September 2026, PIB.

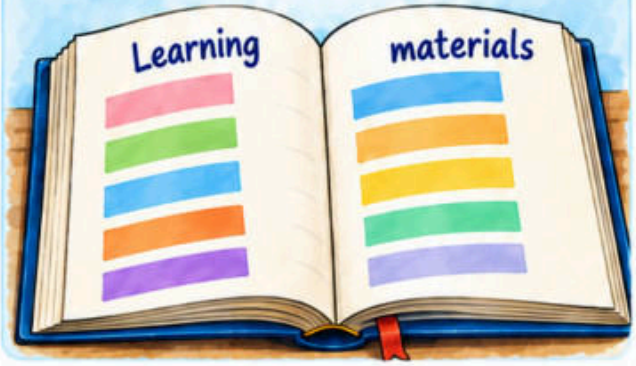
about 4.03 crore REGISTERED LEARNERS



over 52.20 lakh VOLUNTEERS



27 LANGUAGES



more than 3.3 crore FLNAT PARTICIPANTS



Registration → Learning → Assessment → Certification



- Different counters measure different stages; do not add them or treat registration as completion.
- Old 8 September 2025 figures are historical, not the latest snapshot. Source: PIB, 29 September 2026.

A full-literacy declaration needs a date.

PIB snapshot (29 September 2026):

10 States/UTs declared full literacy during 2024–2026.

1. Ladakh
2. Mizoram
3. Goa
4. Tripura
5. Himachal Pradesh
6. Chandigarh
7. Andaman & Nicobar Islands
8. Sikkim
9. Uttarakhand
10. Jammu & Kashmir

List order is NOT a chronological ranking.

What does the date show?

A full-literacy declaration is linked to a specific time period. The PIB snapshot of 29 September 2026 reports the total of 10 States/UTs declared full literacy during 2024–2026. This is not an undated current count.



Verified milestones

24 June 2024
Ladakh first UT.

23 June 2025
Tripura third State after Mizoram and Goa.

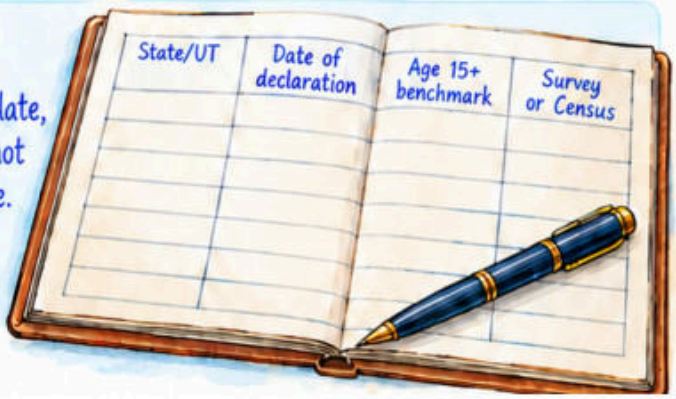
Checklist for a full-literacy declaration

- ☐ Date?
- ☐ State or UT?
- ☐ Age 15+ benchmark?
- ☐ Survey or Census?

Build a reliable revision note

In your revision note, record the State or UT, the date, the age group and the programme benchmark. Do not confuse a programme declaration with a Census rate.

Sources: PIB, 23 June 2025; 8 September 2025; 29 September 2026.



Why Himalayan rivers keep flowing

Indus, Ganga and Brahmaputra systems.

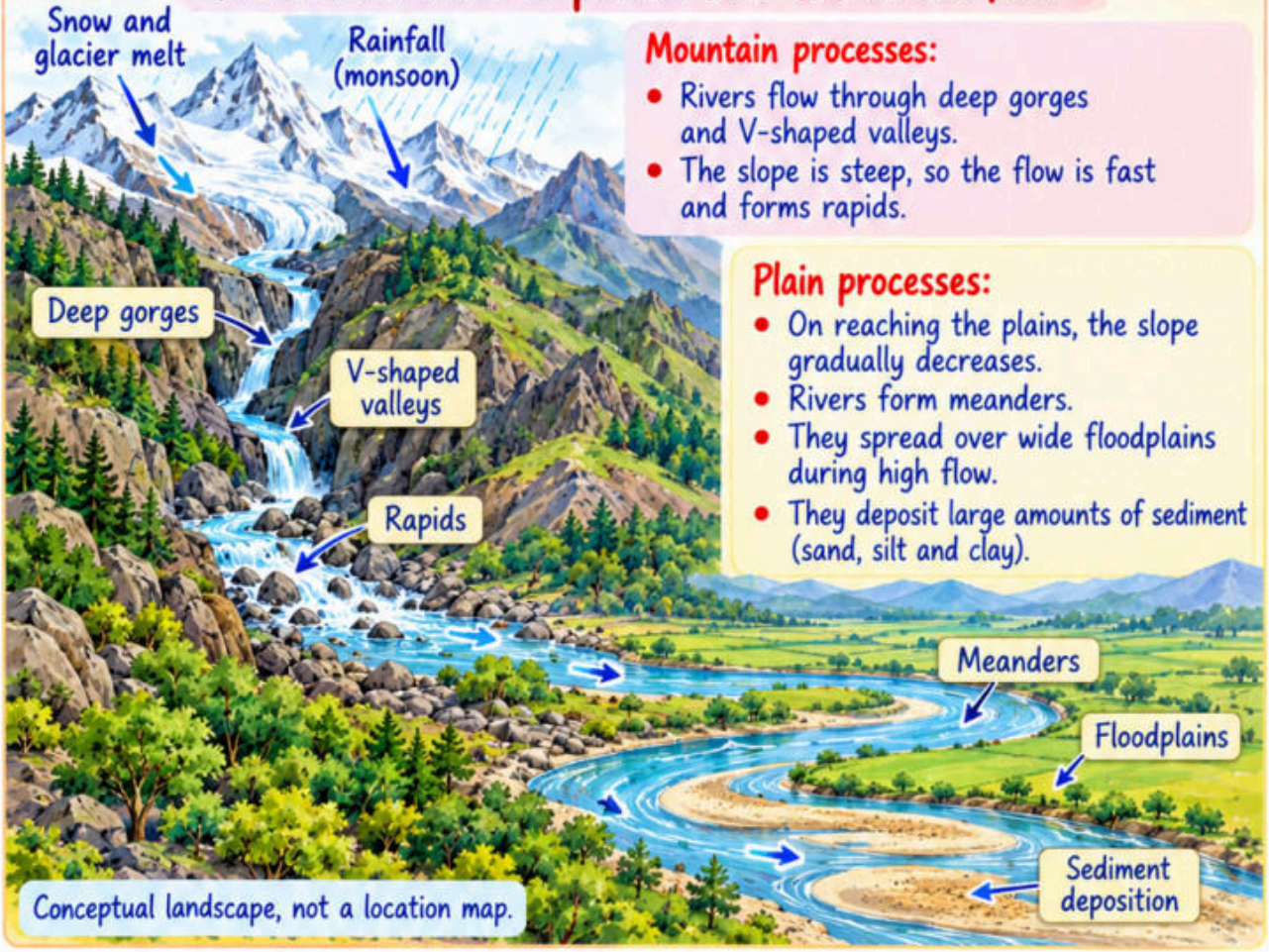
Key idea:

Most Himalayan rivers are perennial, but flow still varies by season.

Reasons for continuous flow:

- Snow and glacier melt in the Himalayas.
- Heavy rainfall during the monsoon.
- These sources together keep the rivers flowing through the year.

From mountains to plains: how the rivers flow



Mountain processes:

- Rivers flow through deep gorges and V-shaped valleys.
- The slope is steep, so the flow is fast and forms rapids.

Plain processes:

- On reaching the plains, the slope gradually decreases.
- Rivers form meanders.
- They spread over wide floodplains during high flow.
- They deposit large amounts of sediment (sand, silt and clay).

Himalayan and Peninsular rivers: a broad comparison

Himalayan rivers

- Indus, Ganga and Brahmaputra systems.
- Fed by snow and glacier melt as well as monsoon rainfall.
- Mostly perennial, but flow varies by season.



Peninsular rivers

- Depend more strongly on monsoon rainfall.
- Generally seasonal, with much lower flow in the dry season.
- Do not have large snow or glacier sources.



Conceptual illustrations, not surveyed locations. Sources: NCERT XI 2020-21; Lahaul-Spiti district.

Indus tributaries: learn how they begin.

1. Jhelum

Verinag spring is the source of the Jhelum.



2. Chenab

Chandra and Bhaga rivers meet at Tandi in Lahaul-Spiti district to form the Chenab.



3. Ravi

The Ravi rises in the Kullu hills west of Rohtang pass.



4. Satluj

The Satluj rises from Raksas Tal near Mansarovar.



5. Beas

The Beas rises from Beas Kund near Rohtang pass.



Important link

At Harike, Beas joins Satluj.



Conceptual illustrations, not surveyed locations. Sources: NCERT XI 2020-21; Lahaul-Spiti district.

River lengths: identify the source and scope

NCERT Class XI (2020–21)

River	Total length (km)	Length in India (km)
Indus	2,880	1,114
Ganga	2,525	–

NCERT Class IX (2020–21)

River	Total length (km)	Length in India (km)
Indus	2,900	–
Ganga	over 2,500	–

Different statements in textbooks

- Class XI (2020–21) gives total and India stretch for the Indus, and total length for the Ganga.
- Class IX (2020–21) gives a different total length for the Indus and describes the Ganga length as "over 2,500 km".
- These are edition-attributed statements, not a resolution of differing measurements. Keep their sources visible.

Functional scope: whole river contains India stretch

Whole river
(total length in km)

Part of the same river
(India stretch in km)

- The length of the river in India is a part of the total length of the river.
- India stretch cannot be longer than the total length.

Indus basin area (Class XI, 2020–21)

Region	Area (sq. km)
Total Indus basin	11,65,000
Part in India	321,289

Units measure different things

km measures
LENGTH



sq. km measures
AREA



1 sq. km

Key takeaways

- River lengths can be reported differently in different textbooks (e.g., 2,880 km vs 2,900 km for the Indus; 2,525 km vs over 2,500 km for the Ganga).
- Always note the edition (Class IX or Class XI, 2020–21), the unit (km or sq. km) and the geographical scope (total river or part in India) before answering.
- The India stretch is a part of the total length, not a separate river.
- The Indus basin area (11,65,000 sq. km total; 321,289 sq. km in India) refers to area, not length.

Final cue: Check edition, unit and geographical scope before answering.

Source: NCERT Classes IX and XI, 2020–21.

The1960 Treaty divides rivers, not a fixed percentage.

Historical treaty framework.

EASTERN

Ravi, Beas, Sutlej; waters available to India subject to Treaty provisions.







WESTERN

Indus, Jhelum, Chenab; waters to flow to Pakistan, with specified Indian uses.








domestic use


non-consumptive use: navigation


agriculture under Annexure C


hydropower under Annexure D

Date strip:

- 19 September 1960 — signed 19 September 1960
- 12 January 1961 — entered into force 12 January 1961
- 1 April 1960 — retrospective effect 1 April 1960

Treaty text is separate from later abeyance dispute.

Source: UN Treaty Series 419, No 6032, Articles I–III and XII.

Abeyance: state the position, not an invented legal conclusion.

Key timeline

23 April 2025
India announced Treaty in abeyance [PIBMay2025].

31 August 2026
official Indian statement reiterates that decision remains in force [Embassy of India, Belgrade].

Background of the Treaty



1960
river allocation rules.



1961
entry into force.

2025–26 diplomatic developments





COMPARE:

India's stated position

India announced Treaty in abeyance on 23 April 2025, and the official Indian statement of 31 August 2026 reiterates that decision remains in force.



Not a mutually agreed termination

Abeyance is a state of position taken by India. It is not a mutually agreed termination of the Treaty.

COMPARE:

A dated government statement

The position is based on a dated government statement of 23 April 2025, reiterated on 31 August 2026.



Not a settled conclusion on all legal disputes

This records India's stated position on 31 August 2026. It does not settle all legal disputes.

Source: PIBMay2025; official Indian statement 31 August 2026.

Five confluences along the Alaknanda

1 Vishnuprayag

Dhauliganga joins Alaknanda.



2 Nandprayag

Nandakini joins Alaknanda.



3 Karnaprayag

Pindar joins Alaknanda.



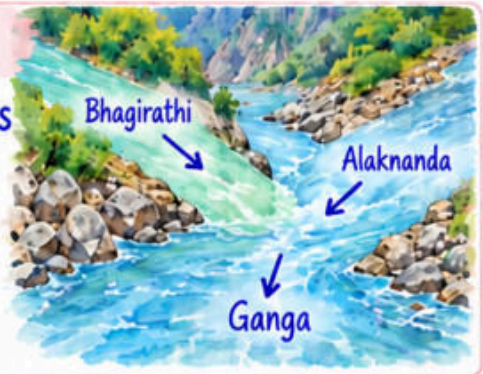
4 Rudraprayag

Mandakini joins Alaknanda.



5 Devprayag

Bhagirathi joins Alaknanda → Ganga.



How a confluence looks



Downstream sequence

Read the numbered chain from 1 to 5. At Devprayag, Bhagirathi meets Alaknanda. The combined river is called Ganga.

Ganga enters plains at Haridwar.

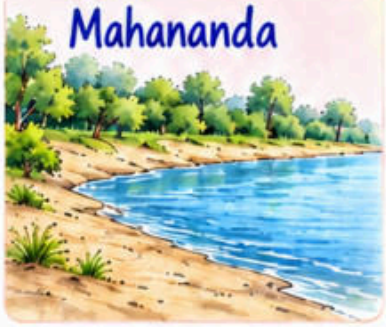


Conceptual confluence illustrations; not surveyed locations or bank positions.
Source: NCERT Class XI 2020–21; official Chamoli and Rudraprayag district pages.

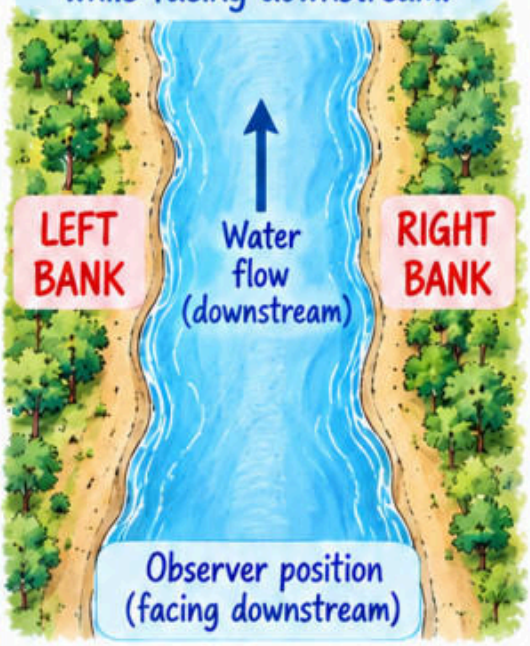
Ganga tributaries: bank means downstream orientation

LEFT-BANK:

Ramganga
Gomti
Ghaghara
Gandak
Kosi
Mahananda



Bank names are defined while facing downstream.



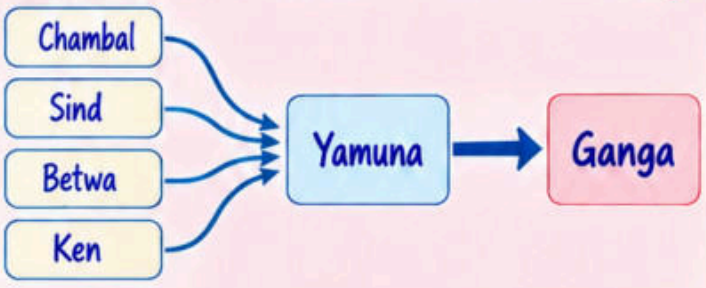
RIGHT-BANK:

Yamuna
Son



Tributary relationships

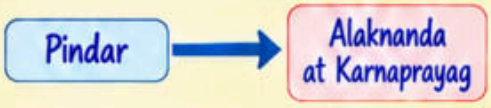
Chambal, Sind, Betwa, Ken → Yamuna → Ganga



Gandak → Ganga at Sonpur near Patna

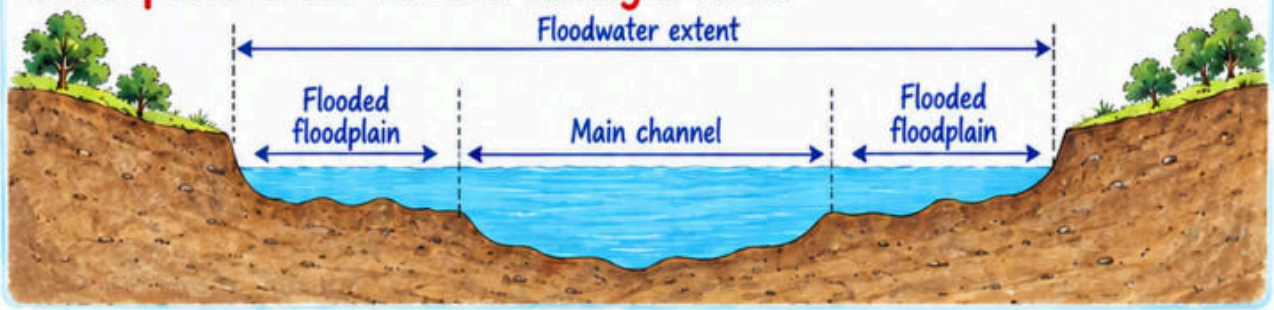


Pindar → Alaknanda at Karnaprayag



Tributary of a tributary is not a direct tributary of the main river.

Conceptual cross-section during a flood



Source: NCERT Class XI 2020–21.

Brahmaputra: one river, changing names.

Name sequence (not a map)

Tsangpo [Tibet] → Siang/Dihang [Arunachal Pradesh] → Brahmaputra [Assam] → Jamuna [Bangladesh] → meets Padma



Dibang and Lohit join Siang/Dihang.



Grouped relationship, not exact confluence geometry.

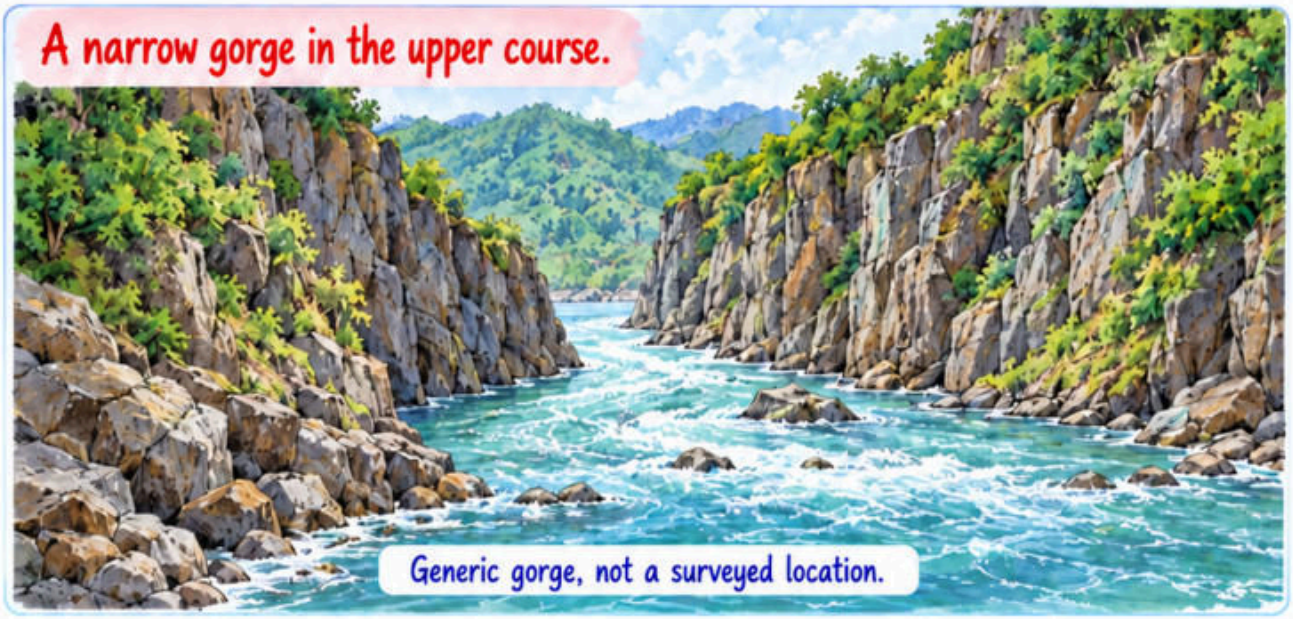
Main tributaries of the Brahmaputra.

LEFT BANK	RIGHT BANK
• Dibang	• Subansiri
• Lohit	• Kameng
	• Manas
	• Sankosh



Banks are identified facing downstream.

A narrow gorge in the upper course.



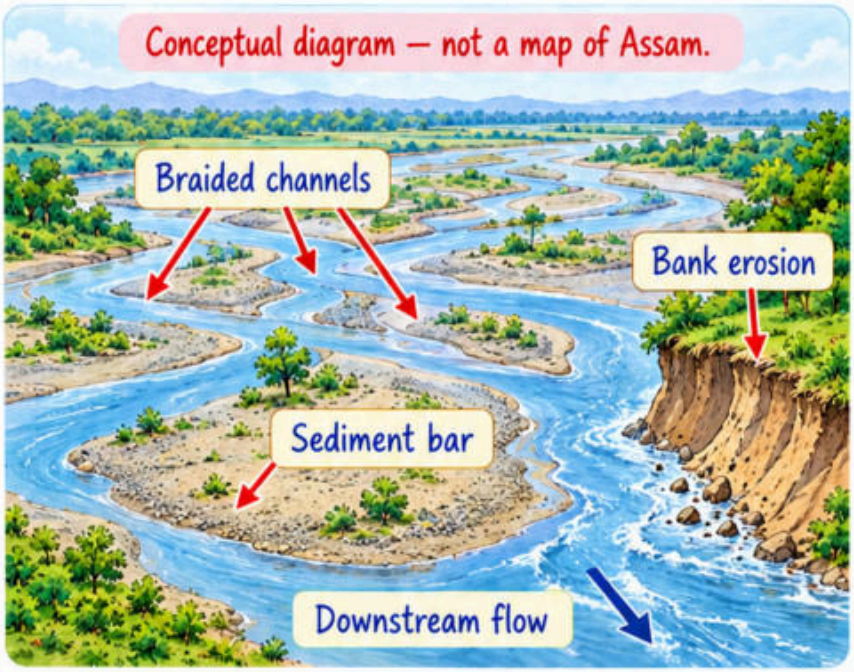
Generic gorge, not a surveyed location.

Source: NCERT Class XI 2020–21.

Braiding, erosion and navigation are connected.

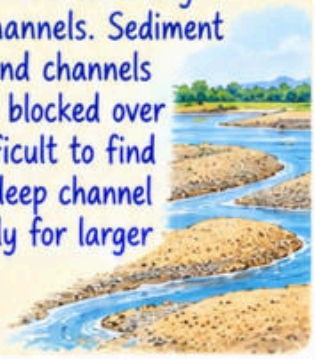
Braided rivers

Rivers like the Brahmaputra carry a very large amount of sediment (sand, silt and gravel). When the sediment load is high, the river tends to split into many shallow channels around sediment bars. These channels keep shifting with time. This pattern is called a braided river system.



Why navigation is difficult

A heavy sediment load creates many shallow and shifting channels. Sediment bars change position, and channels may become shallow or blocked over time. This makes it difficult to find and maintain a stable deep channel for navigation, especially for larger vessels.



Why bank erosion risk increases

During floods, the fast moving flow is forced to take different channels. The flow hits the banks with high velocity, especially at outer bends, and removes soil and sediment. Continuous shifting of channels increases the risk of bank erosion along the river.



National Waterway 2 — Brahmaputra

The inland stretch of the Brahmaputra from the Bangladesh border at Dhubri to Sadiya has been declared as National Waterway 2.

Stretch:	Bangladesh border (Dhubri) to Sadiya
Length:	891 km
Declared on:	1 September 1988

Source: IWAI National Waterways 2 webpage; NCERT.



The 891 km refers to the length of National Waterway 2 only, and should not be confused with the total length of the Brahmaputra river.

River current affairs: separate action from outcome.

1. NAMAMI GANGE

A government programme to clean and rejuvenate the Ganga through pollution control and ecological restoration. Key components include:

Sewage treatment

Setting up and upgrading sewage treatment plants (STPs) to treat domestic wastewater before it enters the river.



Industrial effluent monitoring

Monitoring and regulating industrial effluents so that they meet prescribed standards before release into the river.



Biodiversity

Conserving aquatic life such as fish and river dolphins and protecting their habitats.



Afforestation

Planting trees in the river basin and along riverbanks to reduce erosion, improve ecosystem health and support water conservation.



Riverfront development

Creating clean and accessible riverfronts with proper waste management, sanitation and green spaces along the river.



How the components work together

Pollution control + Ecological restoration → River rejuvenation objectives: Cleaner water, healthier ecosystems and a more sustainable river.

Do not claim that a clean river has been achieved.
The programme is ongoing, with multiple actions working towards long-term objectives.

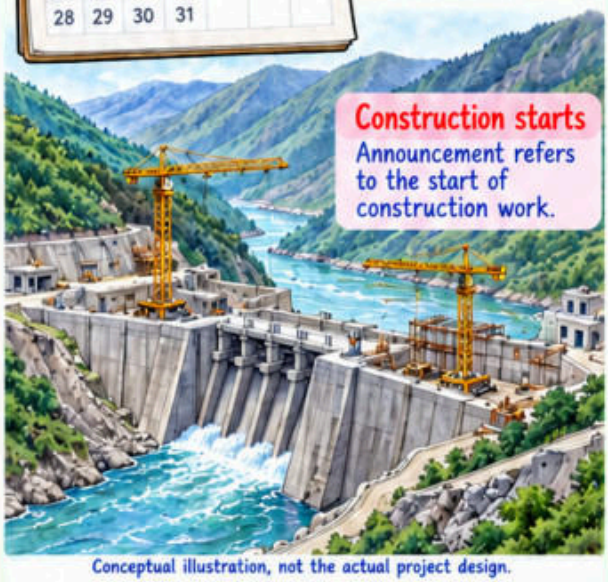
2. CHINA'S LOWER YARLUNG ZANGBO PROJECT

According to the official government portal, China announced the start of construction of the lower Yarlung Zangbo project on 19 July 2025 at Nyingchi.



19 July 2025

Official government portal reports construction-start announcement at Nyingchi.



Construction starts

Announcement refers to the start of construction work.

Conceptual illustration, not the actual project design.

Not proof of completion.

A construction-start announcement does not mean that the project has been completed or is operational.

KEY COMPARISON

Announced construction ≠ completed project

An official announcement of the start of construction is only the beginning of a project. It is not the same as a completed or operational project.



Construction starts (announcement) → Completed project (in operation)

Concern about impact ≠ measured impact

Concerns about possible environmental and social impacts are different from measured impacts, which can only be assessed through detailed studies and monitoring after data becomes available.



Concern about impact (potential effects) → Measured impact (based on data)

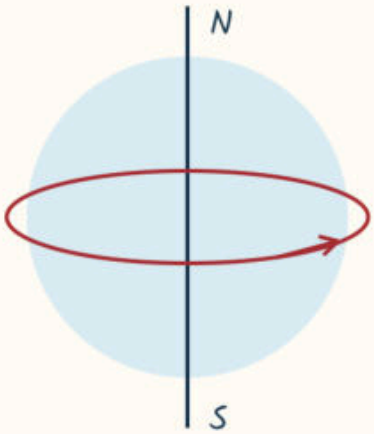
Sources: NMCG Namami Gange; China government portal, 19 July 2025.

256.01 | EARTH AND SEASONS

One planet, two motions

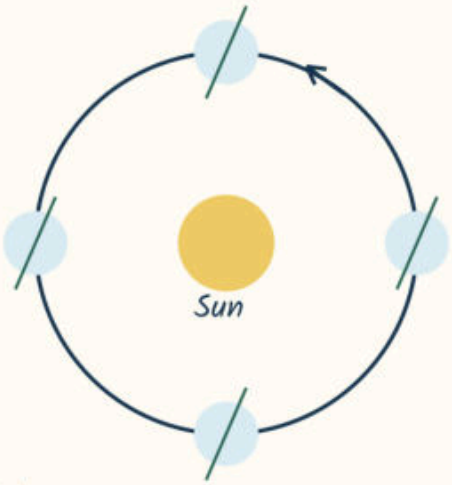
Rotation produces the daily cycle; revolution is the yearly journey around the Sun.

Rotation: spin on the axis



About 24 hours

Revolution: orbit the Sun



About one year

Circular orbit sketch: not a scale model; axes stay parallel.

A year has more than one definition

Sidereal: 365.256 days — measured against stars

Tropical: 365.242 days — seasonal cycle

The school 365¼ days is an approximation. Gregorian leap years are divisible by 4, except century years unless divisible by 400.

1900: no leap day | 2000: leap day | 2100: no leap day

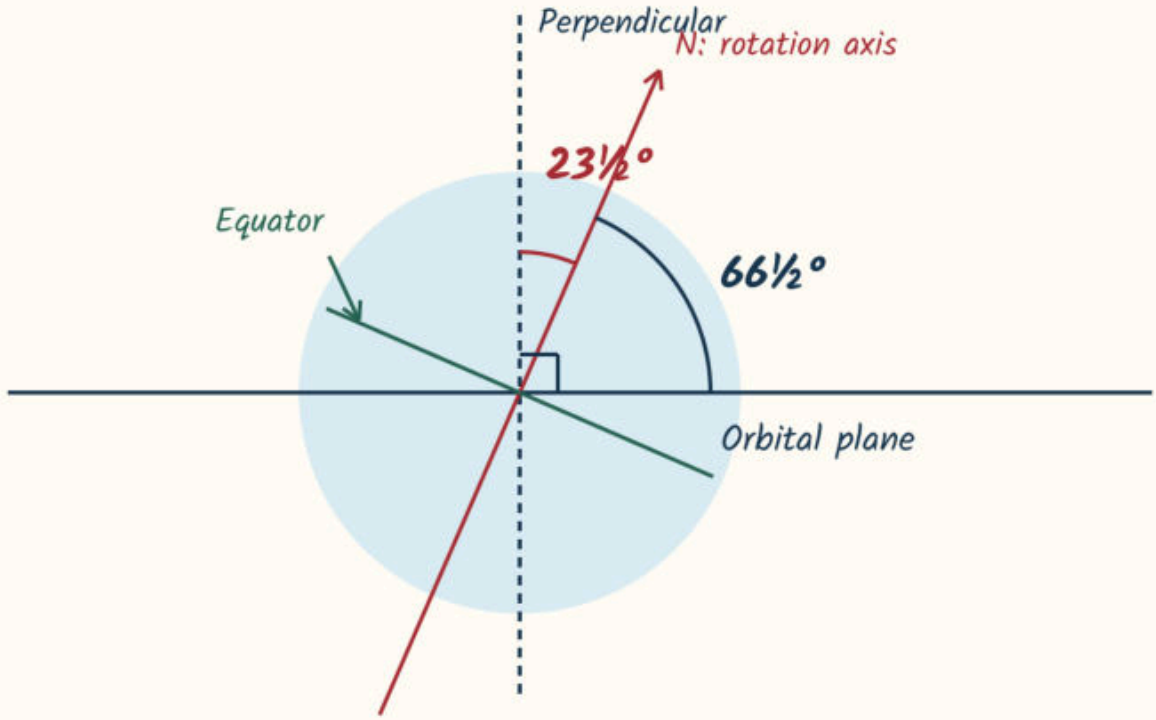
Source: NASA Earth Fact Sheet (15 Nov 2024); supplied NCERT calendar approximation. Schematic spheres, no maps.

Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

256.02 | EARTH AND SEASONS

Two angles, one tilted axis

Measure from the reference line named in the question—not from whichever line looks closest.



23½° + 66½° = 90°

NASA lists obliquity as 23.44°. The familiar 23½° and 66½° are school approximations.

The axis points in approximately the same direction over one yearly orbit. It is not permanently fixed: precession and tilt vary over longer timescales.

Sources: NASA Earth Fact Sheet (IS Nov 2024); NASA Space Place. Geometry is a schematic, not a map.

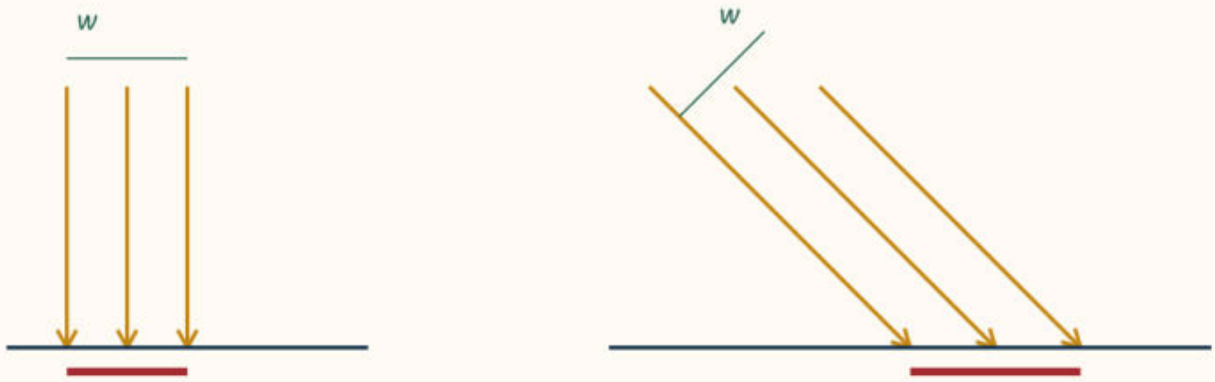
Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

256.03 | EARTH AND SEASONS

Tilt changes intensity and duration

Two linked mechanisms explain why a hemisphere warms more in its summer.

1 Same beam width, different ground footprint



Steeper rays
smaller footprint

Slanting rays
larger footprint

For an equal-width beam, lower solar elevation spreads the incoming energy over more ground area. These beams illustrate geometry, not measured surface temperatures.

2 Longer daylight means more heating time

The hemisphere tilted toward the Sun has longer days and a higher midday Sun. The other hemisphere experiences the opposite seasonal tendency.

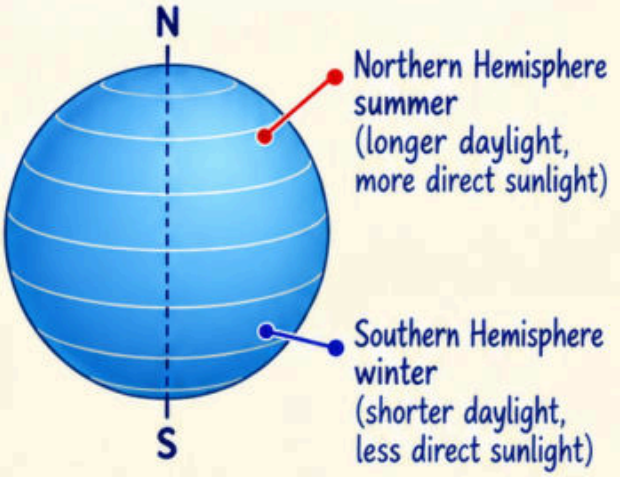
Higher Sun + longer day: stronger seasonal heating

Source: NASA Space Place, "What causes the seasons?" Beam diagrams are schematic; no invented measurements.

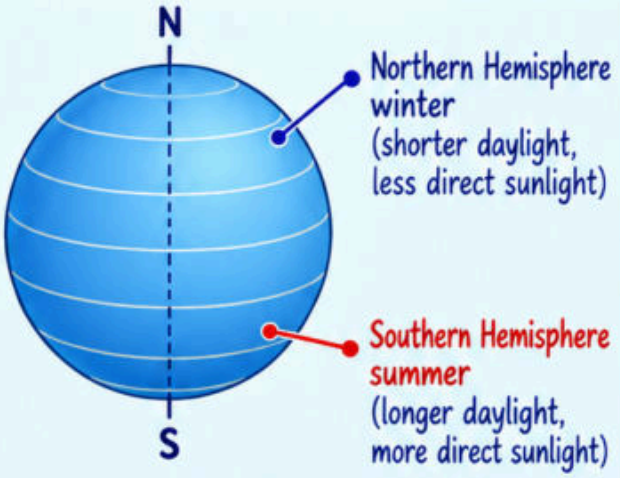
Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

The two hemispheres share one distance—but opposite seasons.

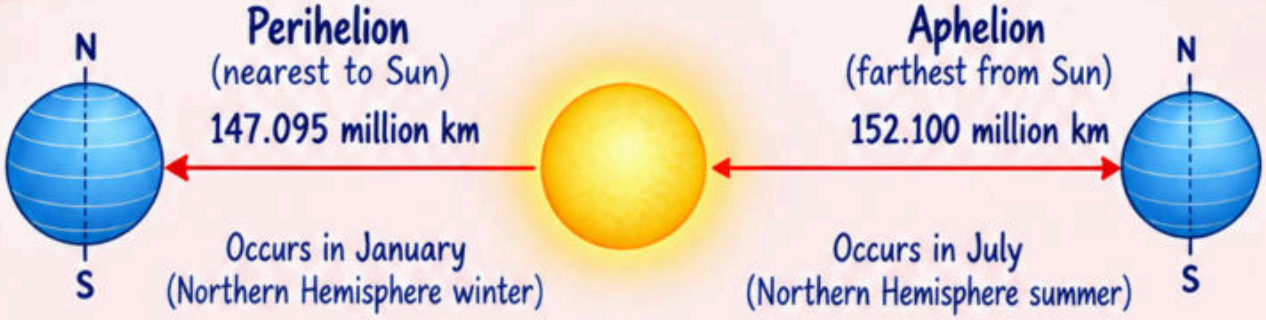
June: Northern Hemisphere summer, Southern Hemisphere winter



December: Northern Hemisphere winter, Southern Hemisphere summer



Earth's distance from the Sun is not constant.



Key numbers (NASA, 15 Nov 2024)

Perihelion distance (nearest, January)	147.095 million km
Aphelion distance (farthest, July)	152.100 million km
Mean orbital velocity	29.78 km/s
Orbital eccentricity	0.0167

What these numbers mean

- Earth is closer to the Sun in January (Northern Hemisphere winter) and farther in July (Northern Hemisphere summer).
- The tilt of Earth's axis is the main cause of opposite seasons in the two hemispheres. The variation in distance is real but has a smaller effect than the tilt.

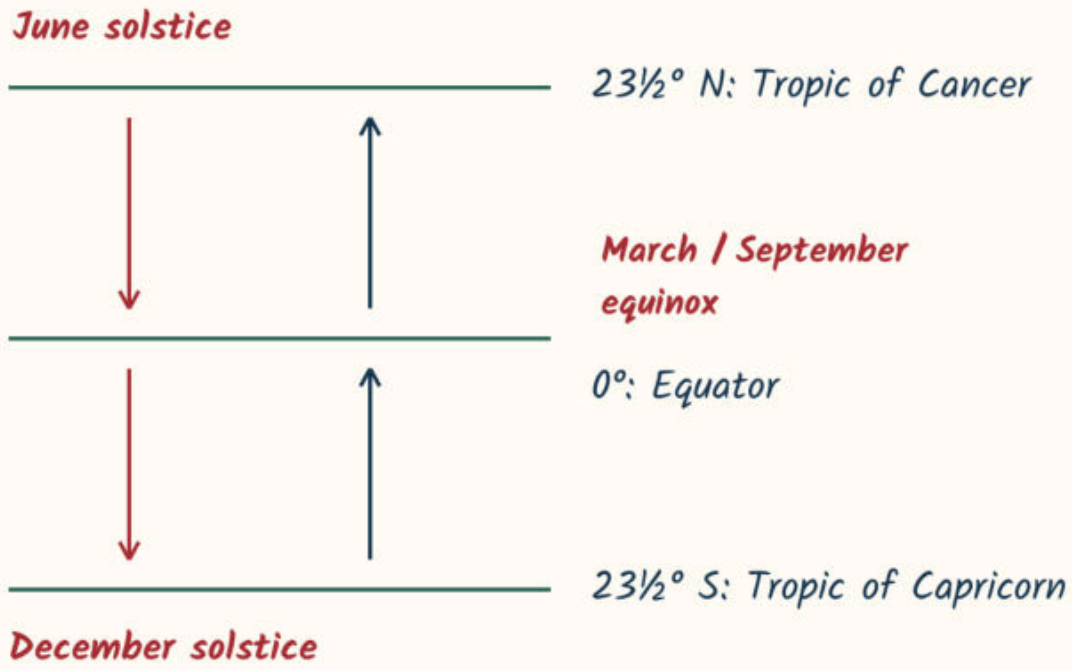
Day 26 | Topic 256 | 256.04

Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

256.05 | EARTH AND SEASONS

Follow the overhead Sun

Subsolar latitude moves north and south; it does not remain over one tropic.



Marker	Northern half	Southern half
March	Spring	Autumn
June	Summer	Winter
September	Autumn	Spring
December	Winter	Summer

The Sun crosses the Equator twice each year. Dates depend on the year and time zone; "21 March" is not a universal annual date.

Sources: NASA Space Place; USNO seasons data. Latitudes shown at school approximation; no geographic map.

Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

256.06 | EARTH AND SEASONS

Equinox is not an exact 12-hour promise

Astronomical equality and measured sunrise-to-sunset daylight are different ideas.

Geometric model

At equinox the Sun's centre crosses the celestial equator. In a simplified point-Sun, no-atmosphere model, day and night are about equal away from the poles.

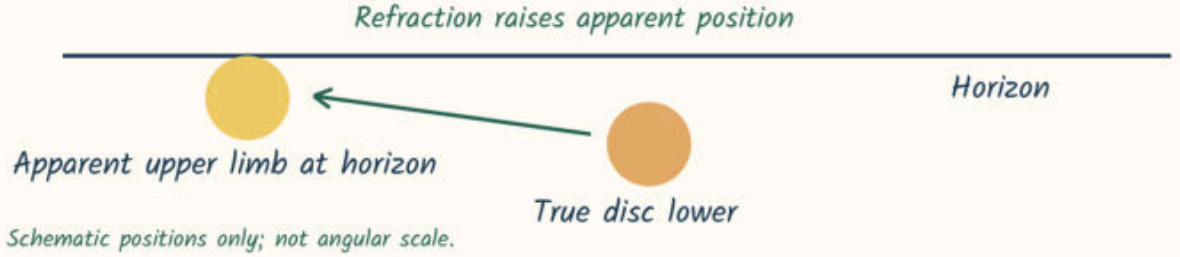
Observed sunrise and sunset

Sun has a disc → Use its upper limb

Atmosphere refracts light → Sun appears higher

Both effects extend visible daylight beyond the simple centre-of-Sun calculation.

Local equality depends on latitude and can occur on another date. The exact-12-hour rule is not universal, especially at the poles.



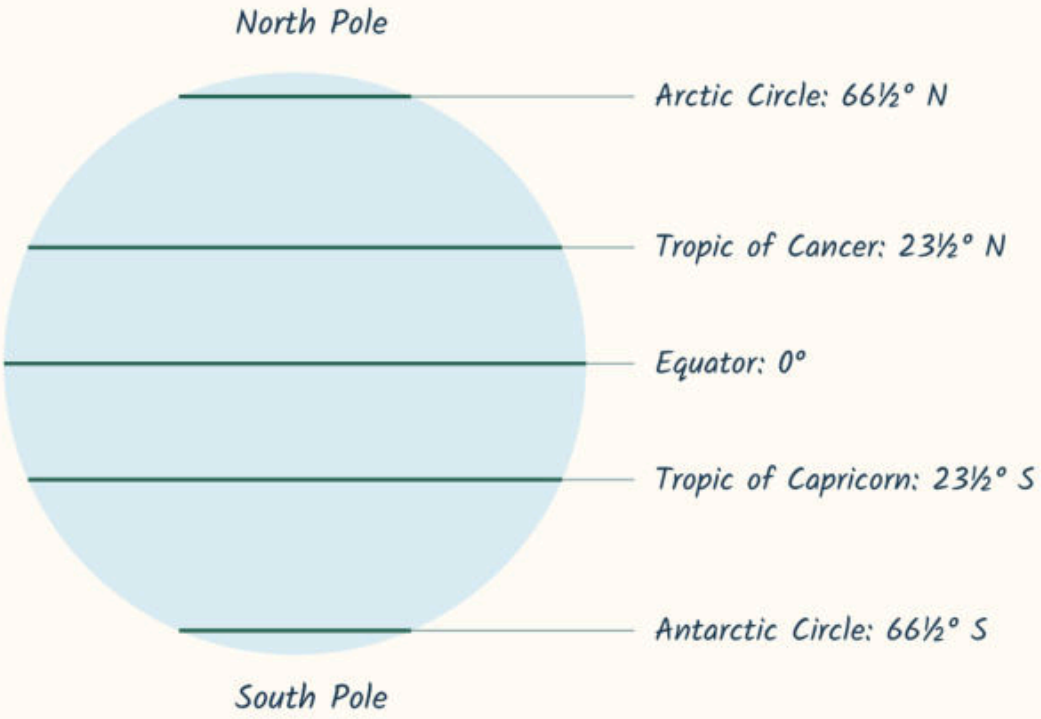
Source: US Naval Observatory, "Autumn Arrives", 19 Sept 2023. Its local 2023 example is not a global date.

Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

256.07 | EARTH AND SEASONS

Polar circles: 90° minus the tilt

Tropics and polar circles arise from different geometric relationships.



90° − 23½° = 66½°

Near the polar-circle threshold, continuous day or night begins around a solstice in the ideal model. Toward a pole, the long spells approach half a year.

June: Arctic daylight, Antarctic darkness. December: reverse. NOT every place inside the polar zone has six months of each. Refraction and terrain affect actual observations.

Sources: NASA Space Place; supplied NCERT latitude framework. Plain mathematical sphere, no land boundaries.

Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

256.08 | EARTH AND SEASONS

One instant, two clock readings

2026 seasonal markers: convert UT to IST by adding 5 hours 30 minutes.

Event	UT	IST
March equinox	20 Mar 14:46	20 Mar 20:16
June solstice	21 Jun 08:24	21 Jun 13:54
September equinox	23 Sep 00:05	23 Sep 05:35
December solstice	21 Dec 20:50	22 Dec 02:20

Midnight rollover is the trap

20:50 + 5:30 = 26:20 = next day 02:20

The December 2026 solstice is scheduled for 22 December in IST. As of 1 November 2026, it has not occurred. The astronomical event is the same instant in both columns.

Source: US Naval Observatory API /api/seasons?year=2026, tz=0; exact source times preserved. Checked 1 Nov 2026.

Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

256.09 | EARTH AND SEASONS

Distance events are not solstices

Perihelion and aphelion describe orbital distance—not the north–south limit of the overhead Sun.

Nearest: perihelion

3 January 2026, 17:15 UT

= 3 January, 22:45 IST

Earth is nearest the Sun while the Northern Hemisphere is in winter.

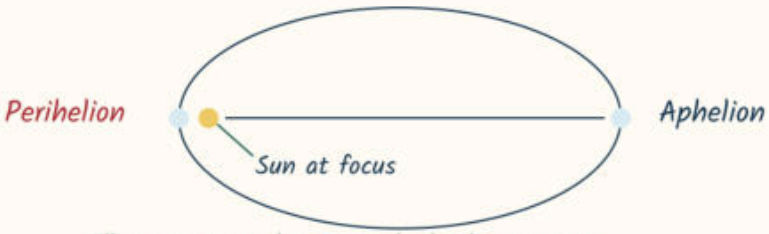
Farthest: aphelion

6 July 2026, 17:30 UT

= 6 July, 23:00 IST

Earth is farthest from the Sun while the Northern Hemisphere is in summer.

Solstices mark maximum north/south solar declination. Distance events fall roughly two weeks later.



Ellipse exaggerated; not actual orbital eccentricity.

Source: US Naval Observatory API /api/seasons?year=2026. Dates and times are for 2026 only.

Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

256.10 | EARTH AND SEASONS

Read daylight data without overclaiming

A worked reading of the USNO coordinate example: 23.5° N, 80° E; IST.

Date 2026	Sunrise	Sunset	Difference
20 March	06:14	18:21	12 h 07 m
21 June	05:24	18:59	13 h 35 m
21 December	06:47	17:29	10 h 42 m

Worked subtraction

18:59 − 05:24 = 13:35

This is one coordinate, not a named city or an all-India daylight figure. The December value is predictive, not an observation already made as of 1 November 2026.

Tilt + revolution change solar angle and daylight duration, producing opposite seasons in the two hemispheres.

Source: USNO rise/set API, 23.5 N, 80 E, tz=5.5. All three dates and arithmetic verified on 1 Nov 2026.

Scientific schematics: no geographic boundaries; sizes and distances are not to scale unless stated.

Day27 | Topic265 | 01

Rice follows heat and water

Climatic requirements (NCERT)

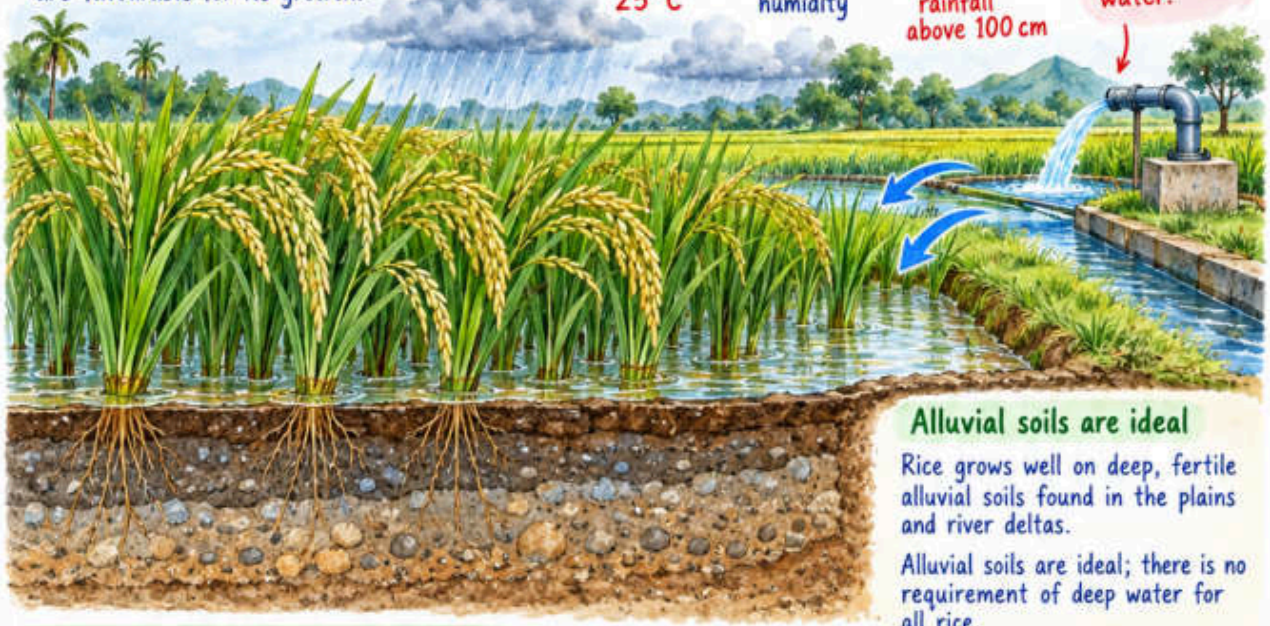
Rice grows well in areas with high temperature and high humidity. It requires an annual rainfall above 100 cm. A temperature above 25°C and a humid climate are favourable for its growth.







Less rain does not exclude rice — irrigation can supply the water.



Alluvial soils are ideal

Rice grows well on deep, fertile alluvial soils found in the plains and river deltas.

Alluvial soils are ideal; there is no requirement of deep water for all rice.

Schematic habitats — not a map

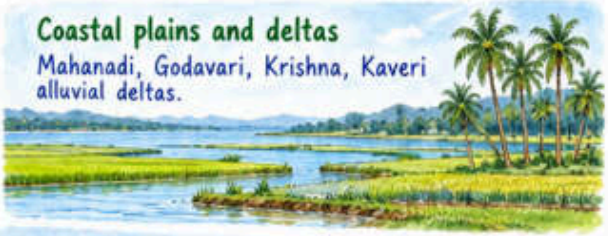
Northern and north-eastern plains

Well-suited due to fertile alluvial soils, adequate heat and rainfall.



Coastal plains and deltas

Mahanadi, Godavari, Krishna, Kaveri alluvial deltas.



Punjab, Haryana, western Uttar Pradesh and parts of Rajasthan

Canals and tubewells permit rice beyond the high-rainfall belt.



Rice cultivation expanded in Punjab and Haryana from the 1970s.

Rice calendar and cropping



Usually kharif.

In the south and West Bengal two or three crops may be grown in a year.

Assam, West Bengal and Odisha aus, aman, boro.



Altitude range

Sea level to about 2,000 m.



About 3,000 varieties in the textbook account.

Nature of cultivation

Rice is described as commercial in Punjab and Haryana, subsistence in Odisha.

Day27 | Topic265 | 02

Wheat follows the cool growing season

Cool growing season



Young wheat plants grow well in the cool weather of winter.



Grain fills as the crop grows towards maturity.

Bright sunshine at ripening



Mature wheat with golden spikes is ready for harvest in the bright sunshine.



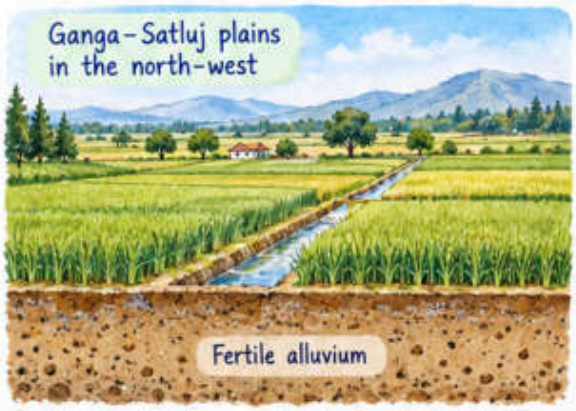
50–75cm annual rainfall, evenly distributed over the growing season.

Rabi season for wheat



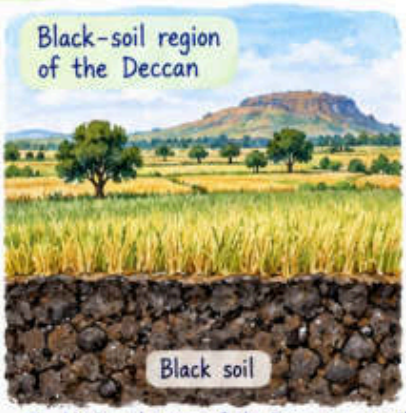
Main food crop of north and north-west India

Ganga–Satluj plains in the north-west



Fertile alluvial plains support extensive wheat cultivation with irrigation.

Black-soil region of the Deccan



The black-soil region of the Deccan is another important wheat zone. Parts of the Malwa Plateau have rainfed wheat.

Important wheat producing states

- Punjab
- Haryana
- Uttar Pradesh
- Madhya Pradesh
- Bihar
- Rajasthan

Primarily temperate crop; grown in the Himalayas up to 2,700m.



Landscape sketches are schematic – not geographical maps.

Mostly irrigated, but rainfed in Himalayan highlands and parts of the Malwa Plateau.

About 85% of wheat area lies in north and central regions – the Indo-Gangetic Plain, Malwa Plateau and Himalayan belt.

Wheat's two important zones are Ganga–Satluj plains and black-soil Deccan.

Day27 | Topic265 | 03

India's rice and wheat: read the units

Production series as in Third Advance Estimates, 27 May 2026

This is a dated estimate series — not a claim about today's latest release.



Production in lakh tonnes

Year	Rice	Wheat
2023 – 24	1,378.25	1,132.92
2024 – 25	1,501.84	1,179.45
2025 – 26 Third Advance Estimates	1,540.24	1,206.57

10 lakh tonnes = 1 million tonnes

2025 – 26 rice ≈ 154.02 million tonnes

2025 – 26 wheat ≈ 120.66 million tonnes

Rice + wheat = 1,540.24 + 1,206.57
= 2,746.81 lakh tonnes

Total foodgrains = 3,765.63 lakh tonnes

Combined share ≈ $\frac{2,746.81}{3,765.63} \times 100 \approx 73\%$

Production = Area × Yield

Production (tonnes) = Area (hectares) × Yield (kg/ha) ÷ 1,000

Match the year and units before calculating. Do not combine 2025 – 26 production with 2024 – 25 area and yield.



Rice (2024 – 25)

Area
51,266.6 thousand hectares
(≈ 51.3 million hectares)

Yield
2,929 kg/ha



Wheat (2024 – 25)

Area
32,804.4 thousand hectares
(≈ 32.8 million hectares)

Yield
3,595 kg/ha

Rice occupied about 1.56 times wheat's area; wheat gave more grain per hectare.

Illustrations are not area-scaled.

Year, unit and estimate status travel with every statistic.

Day27 | Topic265 | 04.

Rice production: the dated State order



Sacks are symbols — not quantity-scaled.

2024-25 production table

Rank	State	Production (thousand tonnes)	Share of India
1	Uttar Pradesh	20,758.7	13.8%
2	Telangana	17,445.7	11.6%
3	West Bengal	16,019.4	10.7%
4	Punjab	14,360.9	9.6%
5	Chhattisgarh	10,368.5	6.9%
6	Odisha	9,527.3	6.3%
All-India 2024-25 total		150,184.3	thousand tonnes

Top-four share: 13.8 + 11.6 + 10.7 + 9.6 = 45.7%, about 46%.

Shares rounded.

Rice order changes with year

2023-24

Rank	State	Production (thousand tonnes)
1	Telangana	16,874
2	Uttar Pradesh	15,990

2024-25

Rank	State	Production (thousand tonnes)
1	Uttar Pradesh	20,758.7
2	Telangana	17,445.7

Different measures in rice statistics (2024-25)

Area is not output or yield.

Largest rice areas (thousand hectares):

State	Area
Uttar Pradesh	7,350.0
West Bengal	5,592.0
Telangana	4,809.5



Yield (production per unit area)

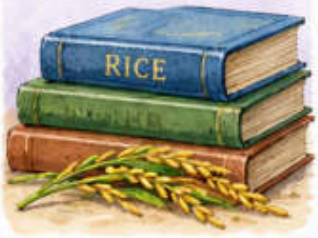
Punjab — 4,428 kg/ha
(highest among States in this 2024-25 table)

All India — 2,929 kg/ha



A useful context

An older textbook list names West Bengal, Uttar Pradesh and Punjab among leading rice producers; a dated annual rank is a different question.



Day 27 | Topic 265 | 05

Wheat output: area and yield both matter



Wheat production by State (2024-25)

Rank	State	Production (thousand tonnes)	Share of India
1	Uttar Pradesh	35,652.9	30.2%
2	Madhya Pradesh	24,509.1	20.8%
3	Punjab	17,993.2	15.3%
4	Haryana	11,399.9	9.7%
5	Rajasthan	11,274.7	9.6%
6	Bihar	7,189.1	6.1%
All India		117,944.5 thousand tonnes	–

Top-four share = 30.2 + 20.8 + 15.3 + 9.7 = 76.0%, about 76% (shares rounded).
About 46% for top four rice States in 2024-25.

A closer look at area and yield (2024-25)

Wheat area (thousand hectares)

State	2024-25
Uttar Pradesh	9,598.8
Madhya Pradesh	7,748.7

Madhya Pradesh is the second-largest by area.



Wheat yield (kg/ha)

State	2024-25
Punjab	5,123
Madhya Pradesh	3,163
All India	3,595

Punjab has the highest yield among States in this table.

Madhya Pradesh's second rank in output reflects its large area, not a top yield; its yield is below the all India figure.

3,163 < 3,595



Production depends on area and yield



Area of wheat under cultivation

×



Grain obtained per hectare (yield)

→



Total wheat production (harvest)

Rice production is more spread out; wheat production is more concentrated.

Illustrations are schematic, not area- or quantity-scaled; no map.

Day27 | Topic265 | 06.

Water, seasons and cropping intensity

Rain-fed field

Field gets water from rainfall.



Irrigated field

Field gets supplementary water from canal or tubewell.



Irrigation changes where rice can be grown

High rainfall in eastern and coastal belts supports rice cultivation.



Irrigation allows rice to be grown in areas with lower rainfall, such as the north-west.



Almost all rice land is irrigated in Punjab, Tamil Nadu, Haryana and Andhra Pradesh in the textbook description.

Economic Survey 2025-26: rice irrigation coverage about 67%.

Rice yields: contrasting examples

Rainfed rice areas in Madhya Pradesh, Chhattisgarh and Odisha have very low yields in the textbook account.

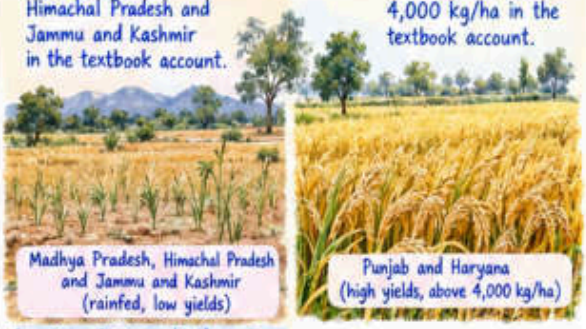
Irrigated rice areas in Punjab, Tamil Nadu, Haryana and Andhra Pradesh have high yields.



Wheat yields: contrasting examples

Low yields in rainfed Madhya Pradesh, Himachal Pradesh and Jammu and Kashmir in the textbook account.

High yields in Punjab and Haryana, above 4,000 kg/ha in the textbook account.



Named places are examples; landscapes are schematic, not geographical maps.

Kharif season

Sown with onset of monsoon.
Harvested September – October.



Rabi season

Sown October – December.
Harvested April – June.



Usually kharif does not mean rice is only a kharif crop everywhere.

Two or three rice crops are grown in south and West Bengal.



Textbook shares of cropped area

Rice accounts for about one-fourth of the cropped area.



Rice about one-fourth

Wheat accounts for about 14% of the cropped area.



Wheat about 14%

Separate 2021–22 Ministry-based calculation

Rice accounts for about 21% of the cropped area.



Rice about 21%

Wheat accounts for about 14% of the cropped area.



Wheat about 14%

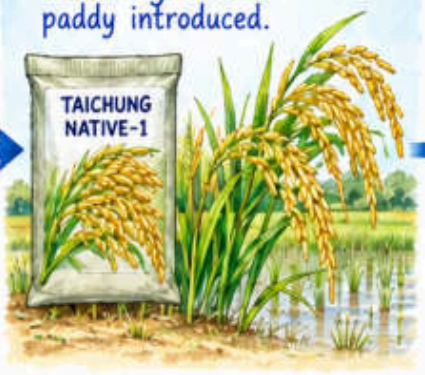
Day27 | Topic265 | 07

The Green Revolution changed the cereal balance.

1963–64
Mexican dwarf wheat varieties tried in India.



1965
Taichung Native-1 paddy introduced.



November 1966
IR8 introduced in India.



Varietal illustrations are schematic, not botanical identification plates.

First phase, roughly mid-1960s to mid-1970s, mainly benefited wheat-growing regions.

Yield change from 1960–61 to 1970–71.



These are yield increases from 1960–61 to 1970–71, not absolute yields or production growth.

Area under rice and wheat (million hectares)

Year	Rice	Wheat
1960–61	34.1	12.9
2022–23	47.8	31.4

Increase in wheat area
$31.4 \div 12.9 \approx$ **2.4 times**

Change in land use — Haryana, Punjab and northern Rajasthan



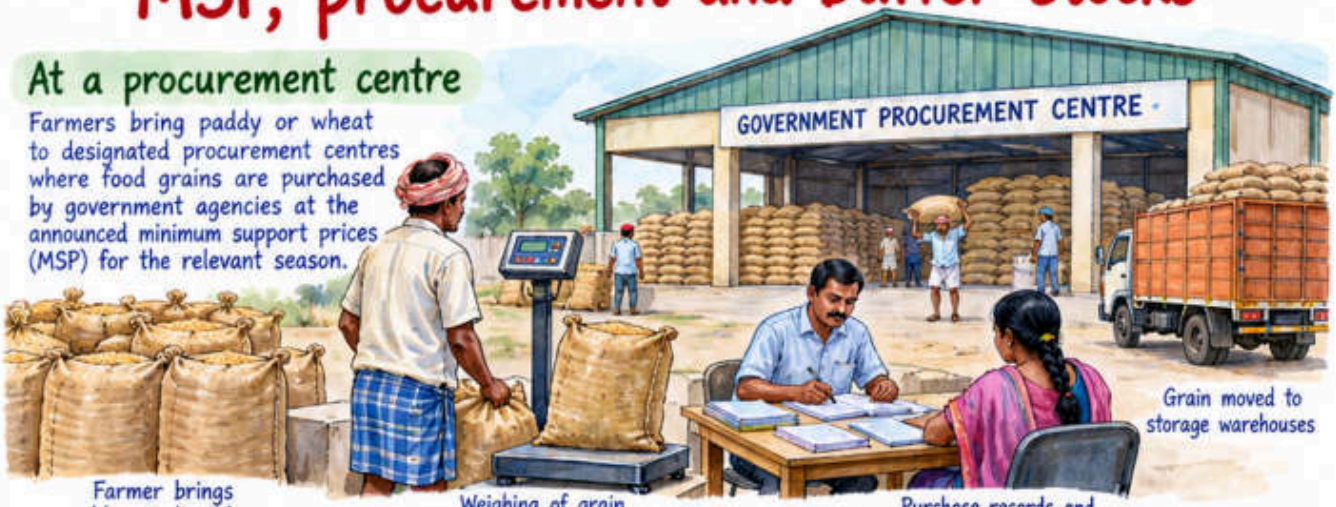
Change in land use — not a plant transforming into another crop.

Day27 | Topic265 | 08

MSP, procurement and buffer stocks

At a procurement centre

Farmers bring paddy or wheat to designated procurement centres where food grains are purchased by government agencies at the announced minimum support prices (MSP) for the relevant season.

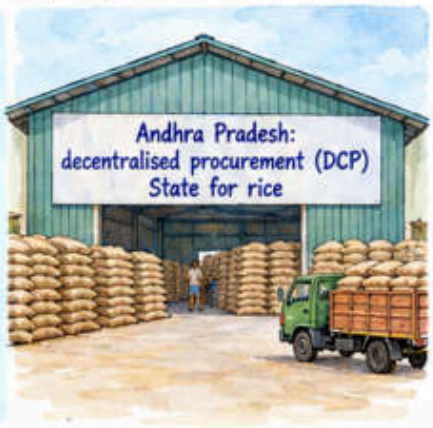


Announced minimum support prices (MSP)

(Rs per quintal)

Crop	Marketing season	MSP (Rs per quintal)	Preceding MSP (Rs per quintal)	Increase (Rs per quintal)
PADDY (Common)	Kharif Marketing Season 2026-27	2,441	2,369	72
Wheat	Rabi Marketing Season 2026-27	2,585	–	–
Wheat	Rabi Marketing Season 2027-28	2,610	–	25 over 2026-27

1 quintal = 100 kg



From procurement to food security



Rice and wheat are the main procured cereals.

Economic Survey 2025-26 reports procurement growing faster than food security needs, with persistently high buffer stocks.

Stocks on 1 January 2026, relative to norms

Crop	Stock relative to norm (on 1 January 2026)
Wheat	about 2 times norm
Rice	about 4 times norm

These are dated stock-to-norm ratios, not the share of annual harvest procured.



Schematic grain storage – not quantity scaled

Day 27 | Topic 265 | 09.

Production rank is not export rank

Historical rice-export position

India was the largest exporter during 2018 – 2022, followed by Thailand and Viet Nam.

Exact 2022 ledger for rice exports

India's rice exports = 22.24 million tonnes

World rice exports = 54.73 million tonnes

Share = 22.24 ÷ 54.73 × 100 ≈ 40.63%



Cargo illustration is not quantity-scaled.

Trade policy – key historical snapshots (dated information)

December 2023 reply

Broken rice and non-basmati white rice exports permitted on the basis of permission amid production uncertainty.

Report dated 4 December 2025

Rice export restrictions were removed in September and October 2024.

Rice export ledger (marketing years)

Marketing year	Rice exports (million tonnes)
2023 – 24	14.4
2024 – 25 (October – September)	22.8 (estimated in the December 2025 report)

Wheat exports and domestic focus

Wheat exports April 2024 – March 2025:

186 thousand tonnes,

against the roughly 113 million tonne 2023 – 24 crop harvested in spring 2024.

A small export quantity, not zero exports.



Textbook information and international comparison

Rice – textbook account

India is the second largest producer after China.

India's share in world rice production was 22.07% in 2018.

Wheat – textbook account

India's share in world wheat production was 12.8% in 2017.

Wheat production comparison (2022)

China 137.7 million tonnes (First)

India 107.7 million tonnes (Second)

Production, exports and domestic procurement answer different questions.

Rice in husk comparisons require a separate grain basis.

Andhra Pradesh: paddy is not milled rice



Paddy – grain with husk

Milling / removal of husk

Husks (separately collected)

Rice – reported on a different processed-grain basis.

Schematic processing; quantities not to scale.

Check grain basis AND year before comparing figures.



Rice mainly in the Godavari and Krishna deltas.

State paddy figures 2022 – 23

Production : **126.30** lakh tonnes

Area : **21.29** lakh hectares

Grown in : both kharif and rabi

West Godavari led area and production in this dated account.

National rice table 2024 – 25

Andhra Pradesh production : **8,159.1** thousand tonnes

About **5%** of India's rice.

Yield : **3,928** kg/ha

No AP wheat shown in this table.

Rounded 2023 international rice-in-husk comparison

(rice paddy, in million tonnes)



China about **207** million tonnes

India about **207** million tonnes

Combined about **52%** of world total about **800** million tonnes

Approximate rounded values are NOT a literal tied rank.

The Indian Ministry's rice statistics use a milled-rice basis; do not mix with paddy / rice-in-husk data.

Textbook context:

For a textbook rice production rank, India is second after China; for a dated international table, state year and grain basis.

Unit reminder:

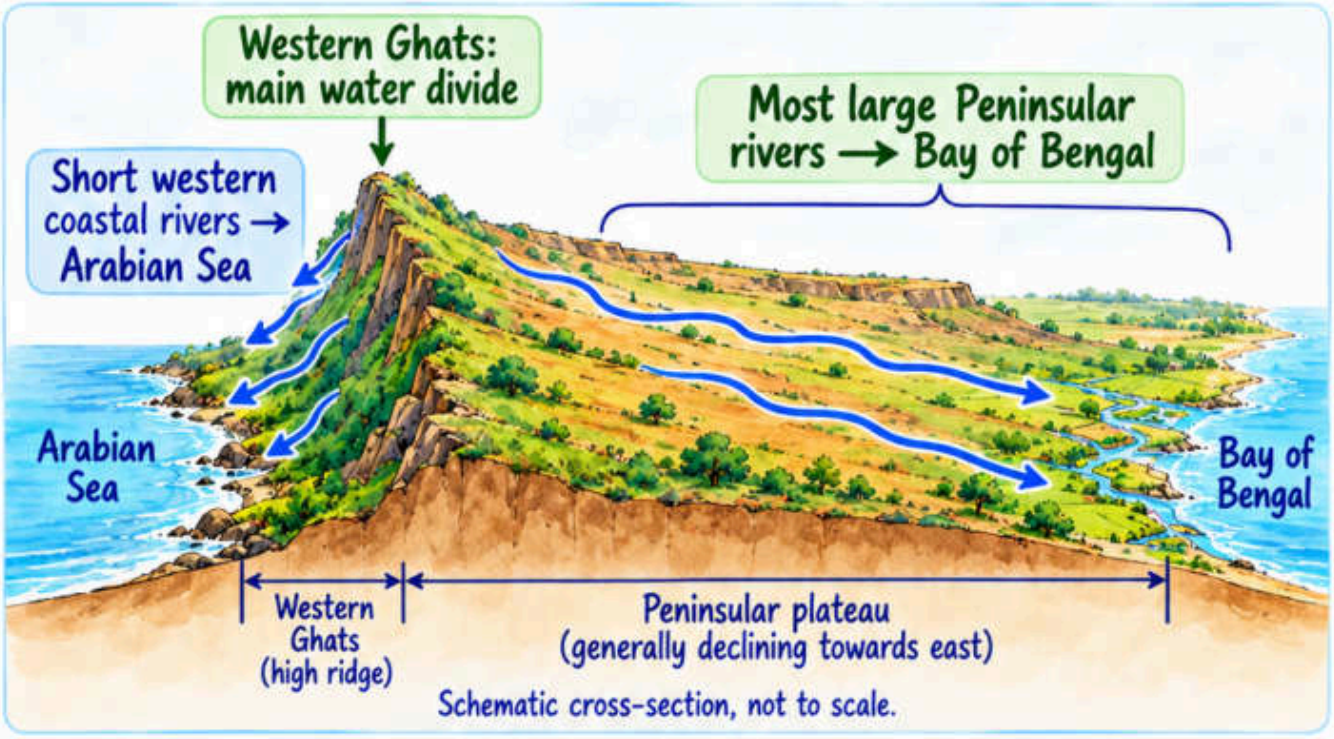
1 lakh tonne = 100,000 tonnes | 1 million tonnes = 10 lakh tonnes | Thousand tonnes is a separate unit.

Main takeaway:

Grain basis + year + unit + measure (production / area / yield / export).

Day27 | Topic266

Peninsular drainage: why most major rivers flow east



Why most large rivers flow east



- The Western Ghats form the main water divide on the western side of the peninsula.
- The Peninsular plateau generally declines towards the east.
- Rivers therefore flow eastwards, covering longer distances before reaching the Bay of Bengal.
- Western coastal rivers are short, due to the steep slope between the Western Ghats and the Arabian Sea.

Narmada and Tapi: important west-flowing exceptions



- Narmada and Tapi flow westwards through rift valleys.
- They are important west-flowing exceptions, not shown by this simple slope alone.
- Their westward flow is due to their rift-valley course, not the general eastward slope of the plateau.

Nature of Peninsular drainage



- Old drainage with broad, generally graded valleys; largely rain-fed.
- Do not interpret a general pattern as a rule without exceptions.

Day27 | Topic266

Four major east-flowing rivers

Conceptual scenes, not exact site reproductions

Mahanadi



Near Sihawa, Chhattisgarh



Hirakud



Bay of Bengal delta

Godavari



Nashik district, Maharashtra



Lower-course branches



Bay of Bengal delta

Krishna



Near Mahabaleshwar



Major plateau river



Bay of Bengal delta

Kaveri



Talakaveri, Brahmagiri hills



Falls and reservoirs



Bay of Bengal delta

Class XI lengths

River	Length
Mahanadi	851 km
Godavari	1465 km
Krishna	1401 km
Kaveri	800 km

Origin, basin and mouth are three different facts.



Origin
The point where a river begins.

Basin
The area drained by the river.

Mouth
The point where a river ends, usually in a sea.

Day27 | Topic266

Godavari: largest Peninsular river

Length

1465 km

One of the longest rivers of India, flowing for 1465 km.



Dakshin Ganga

Godavari is often called the Dakshin Ganga due to its great cultural and economic importance in the southern part of India.



Lower river

- Prone to floods in the lower reaches.
- A gorge is formed near Polavaram.
- In the delta region, it divides into several branches before draining into the Bay of Bengal.



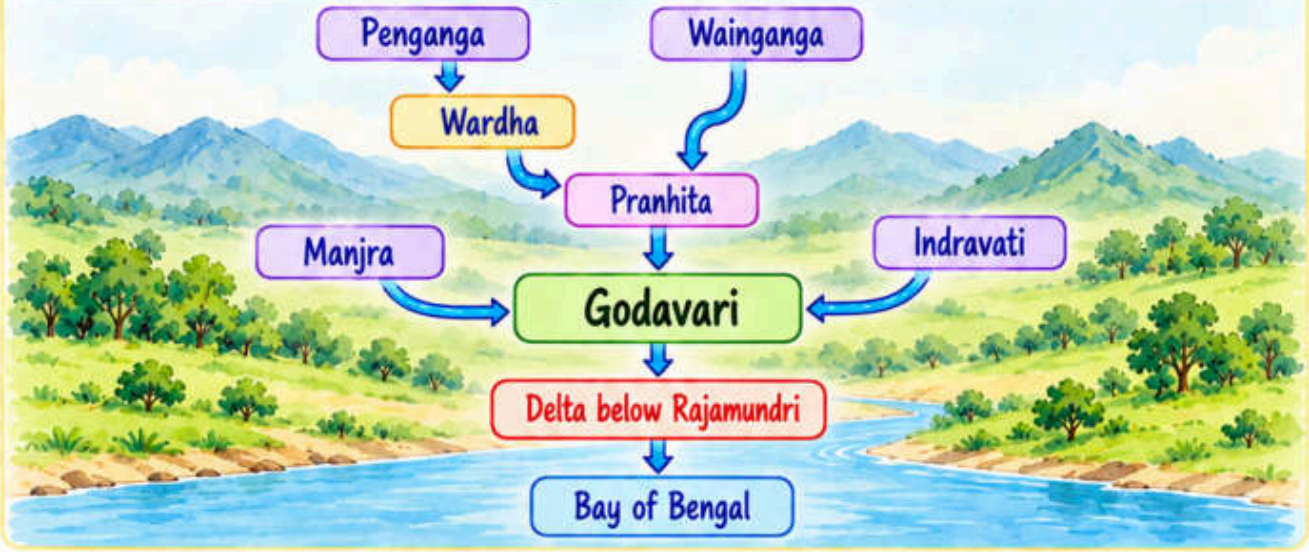
Gorge near Polavaram



Delta below Rajamundri

Godavari river system and important tributaries

(Relationship schematic, not a map)



Basin shares in a CWC 2019 account



- Maharashtra: 48.6%
- Telangana: 18.5%
- Andhra Pradesh: 4.9%
- Other states account for the remainder.

This is basin area, not water allocation.

Day27 | Topic266

Krishna and Kaveri: separate origins and tributaries

Tributary relationships schematic, not a map; placement not geographic

Krishna river and its tributaries



Kaveri river and its tributaries



Comparison of length

Krishna: about 1401 km (Class XI)



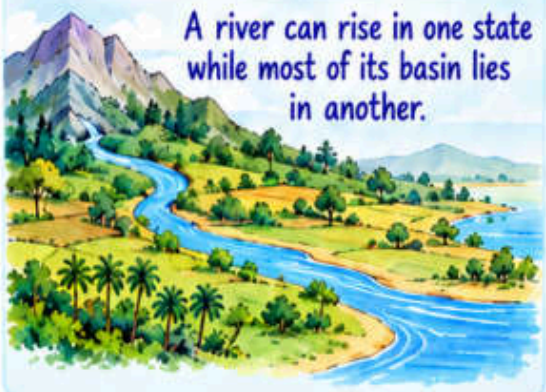
Kaveri: 800 km (Class XI)

Basin area shares of the Kaveri



Basin area shares, not allocations.

A river and its basin



Day27 | Topic266

Narmada and Tapi: the west-flowing rift valleys

Faulted rift valley



Conceptual rift-valley section, not to scale.

Narmada: about 1312 km

Source to mouth



Amarkantak (source) → Jabalpur marble gorge and Dhuandhar → Estuary south of Bharuch → Arabian Sea (mouth)



Narmada corridor: Vindhyan range to the north; Satpura to the south.
Conceptual scenes, not exact site reproductions.

Tapi: 724 km

Source to mouth



Multai, Betul (source) → Surat → Gulf of Khambhat (mouth)

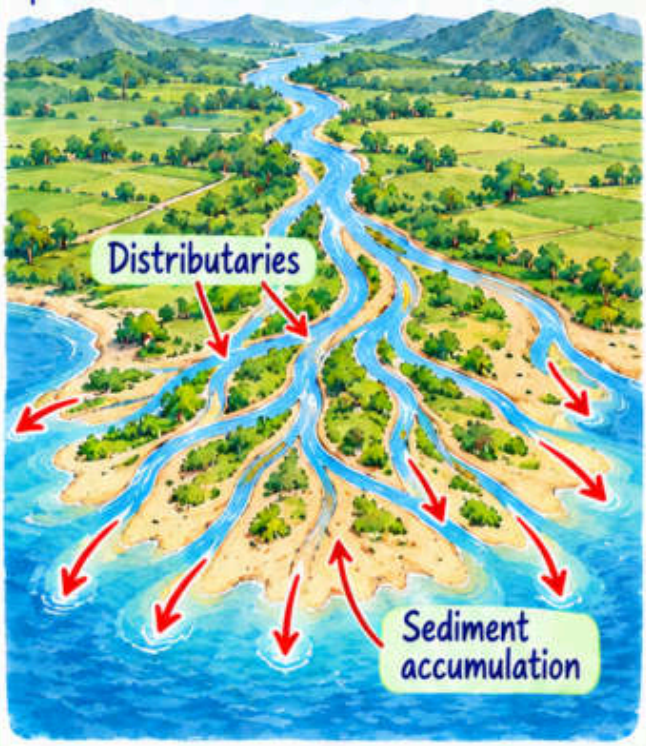
Note: These long west-flowing rivers are exceptions to the dominant eastward drainage. Do not assign them the deltas of the major east-flowing rivers.

Day27 | Topic266

Delta and estuary: two different river mouths

DELTA

A delta forms when a river deposits sediment at its mouth and splits into many distributaries, building a coastal plain that extends into the sea.



Examples:
Mahanadi, Godavari, Krishna, Kaveri

ESTUARY

An estuary is a single, widened river mouth where river water mixes with sea water due to tides.



Examples:
Narmada, Tapi

A delta builds out with deposited sediment;
an estuary is a widened river mouth influenced by the sea.

Not every large river makes a delta.
River flow, sediments, tides and coastal setting all matter.

Day27 | Topic266

Short western rivers and smaller eastern rivers

Conceptual landscapes, not exact site depictions or routes

Western rivers

Many rivers in the west are short because the Western Ghats are close to the coast. They fall quickly and reach the Arabian Sea.



Examples of western rivers

- **Goa:** Mandovi, Juari
- **Karnataka:** Kalinadi, Bedti, Sharavati
- **Kerala:** Bharathapuzha, Pamba, Periyar
- **Maharashtra:** Vaitarna

Smaller eastern rivers

Rivers on the eastern side are generally longer, flowing from the plateau across gentle slopes and reaching the Bay of Bengal. Many of them are smaller rivers.



Examples of smaller eastern rivers

- Subarnarekha, Baitarni, Brahmani
- Vamsadhara, Penna, Palar, Vaigai

Vamsadhara

Near Lanjigarh, Odisha → Kalingapatnam, Andhra Pradesh; about 254 km.



Penna

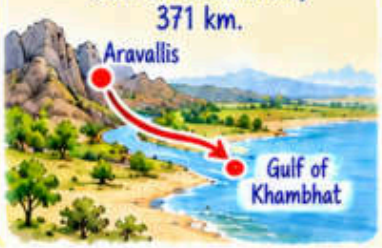
Nandidurg range in Karnataka → Bay of Bengal; 597 km.



Other important west-flowing rivers

Sabarmati

Aravallis → Gulf of Khambhat; 371 km.



Mahi

Vindhyas → Gulf of Khambhat; 583 km.



Reason for short western courses

The Western Ghats are close to the coast. This helps explain why many western rivers have short courses. Narmada and Tapi are long exceptions.



Day27 | Topic266

Waterfalls: link each fall to its river

Illustrative waterfall forms, not exact site reproductions.

Jog / Gersoppa → Sharavati

A major waterfall on the Sharavati River in Western Karnataka.



Western Karnataka.

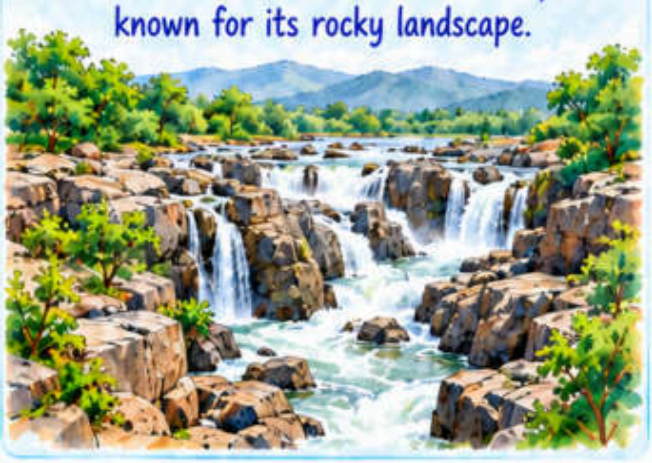
Shivasamudram → Kaveri

A well-known waterfall on the Kaveri River.



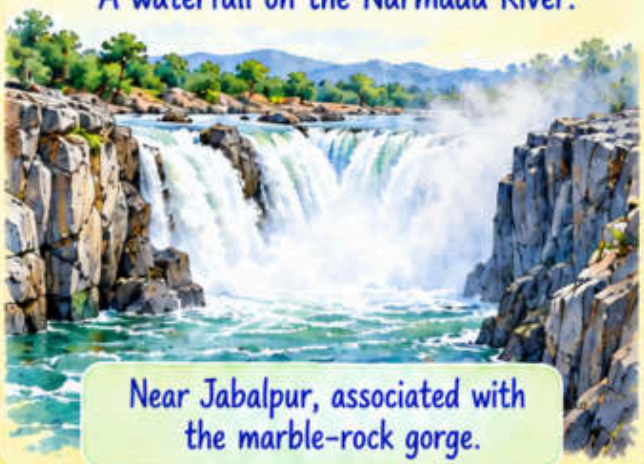
Hogennekkal → Kaveri

A waterfall on the Kaveri River, known for its rocky landscape.



Dhuandhar → Narmada

A waterfall on the Narmada River.



Near Jabalpur, associated with the marble-rock gorge.

Kaveri: Talakaveri source → Shivasamudram → Hogennekkal → Mettur reservoir → delta



Talakaveri source | Shivasamudram | Hogennekkal | Mettur reservoir | delta

Memorise river-fall pairs, not only state names.
One river may have several important falls.

Day27 | Topic266

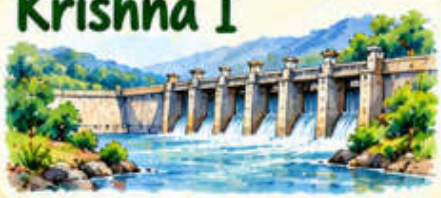
River tribunals: distinguish the dates

Godavari



Constituted → 1969
Report → 1979
Gazette decision → 28 July 1980

Krishna I



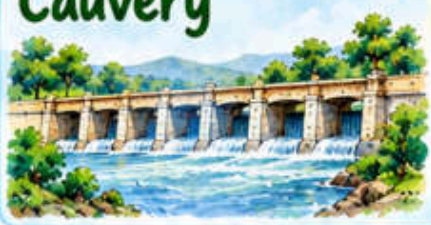
Constituted → 1969
Report → 24 Dec 1973
Further report → 27 May 1976
Publication → 31 May 1976

Narmada



Award → 16 Aug 1978
Final award → 7 Dec 1979
Publication → 12 Dec 1979

Cauvery



Constituted → 1990
Decision → 5 Feb 2007
Published → 19 Feb 2013
Supreme Court modification → 16 Feb 2018

Mahadayi



Report → 14 Aug 2018
Notified → 27 Feb 2020

Constitution

Tribunal is constituted.

Report / decision

Tribunal gives its report or decision.

Publication / motification

Report, award or decision is published or notified.

Judicial modification where applicable

Higher judicial forum may modify the decision.

These are distinct legal milestones, not interchangeable dates.

Krishna II is a different tribunal from Krishna I; do not infer present legal status from an old report date.

Day27 | Topic266

Read river facts with their reference frame

1. Textbook lengths differ

River	Class XI length (km)	Class IX length (km)
Mahanadi	851	about 860
Godavari	1465	about 1500
Krishna	1401	about 1400
Kaveri	800	about 760

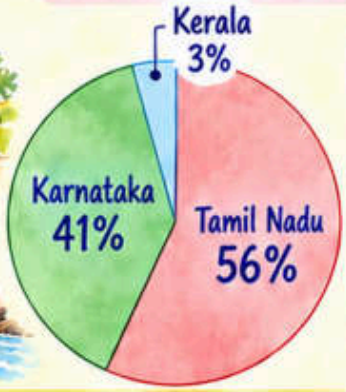
Use the figures of the book named in the question; approximation is not a new river.



2. Source is not basin



Kaveri basin area



The source of a river is not the same as its basin.

Basin area is not water entitlement.

3. Long west-flowing exceptions



Separate rift valleys; conceptual scenes

Most major east-flowing rivers reach the Bay of Bengal and form deltas.



Three questions for every river







Andhra Pradesh: population

The correct 2011 base

Present Andhra Pradesh: 4,95,77,103 people, about 4.96 crore. Density: 304 persons per sq km. Decadal growth, 2001-11: 9.21%. These are recast Census 2011 figures, not a separate post-2014 Census count.



Size and rank

Area: 1,62,970 sq km. Seventh largest among today's States by area. The Survey's eighth rank includes the former State of Jammu and Kashmir. Population rank: tenth among States.



Share of India

4.09% in the Socio-Economic Survey 2024-25 and Technical Group projections report; 4.10% in the 2018-19 Survey. As on 31 October 2026, the latest Survey listed by the State Finance Department was 2024-25.



Do not mix the bases

Undivided Andhra Pradesh, 2011: 84,580,777 people; density 308; growth 11.0%. Present Andhra Pradesh: 4,95,77,103; 304; 9.21%. India: 1,210,854,977; 382; 17.70%.



Why the 2011 figures are recast

Reorganisation in 2014

The Andhra Pradesh Reorganisation Act, 2014 created Telangana. The Act states an Andhra Pradesh : Telangana population ratio of 58.32 : 41.68, based on Census 2011.



Transferred areas

In July 2014, Parliament passed the Reorganisation (Amendment) Act, replacing the Polavaram ordinance. Seven Khammam mandals were transferred: four to East Godavari and three to West Godavari.



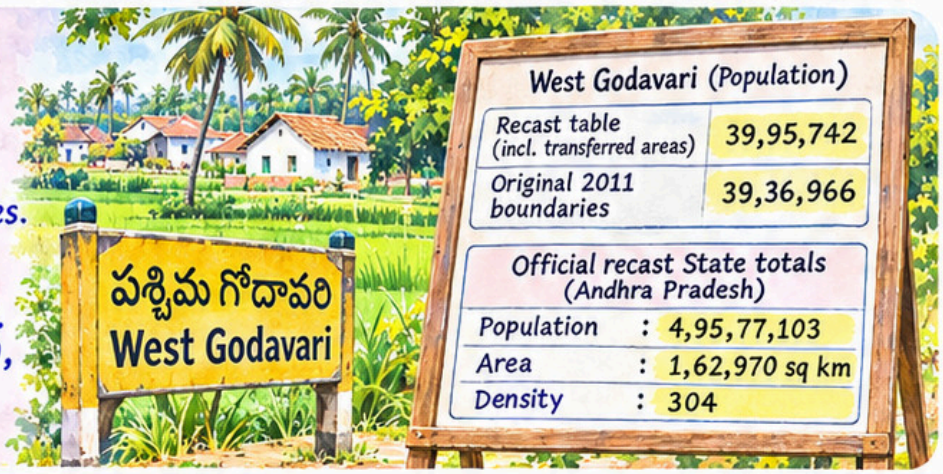
Which population belongs where?

Present AP: 4,95,77,103. Telangana: 3,50,03,674, excluding transferred revenue villages. Together: 84,580,777, the undivided State. Technical Group bases are rounded to 49,577 thousand and 35,004 thousand. Do not calculate the Act's ratio from these recast figures.



A district example

West Godavari: 39,95,742 in the recast table, including transferred areas; 39,36,966 within its original 2011 boundaries. Use the official recast State totals: 4,95,77,103 people, 1,62,970 sq km and density 304. Secondary figures of 4,93,86,799, 1,60,205 sq km or density 308 use different bases.



Source: Corrected Day 28 notes, pp. 27-28 | @iaswithdrravi

Day 28 | Topic 275 | P02

Population density: coast and interior

All district facts refer to 13-district recast 2011 base.

State versus India

Census 2011, recast: Andhra Pradesh 304 persons per sq km; India 382. The State is less densely populated than India as a whole.



Highest and lowest

Among the 13 recast districts: Krishna was densest, 518 per sq km. YSR Kadapa was least dense, 188; Prakasam followed at 193. These last two were below 200.



A coastal concentration

The five densest districts were Krishna, West Godavari, Srikakulam, Guntur and East Godavari. All are coastal. The four Rayalaseema districts ranged from 188 to 275 persons per sq km.



Urban share is not district density

Visakhapatnam was most urbanised, 47.45% urban, yet density was 384. Srikakulam was least urbanised, 16.16% urban, but density was 463. A big city does not automatically make its whole district the densest.



Source: Corrected Day 28 notes, pp. 28-29 | @iaswithdrravi

Day 28 | Topic 275 | P03

Same district name, different area

From 13 to 26 districts

After 2014, Andhra Pradesh had 13 districts. Final notification: 3 April 2022, under the Andhra Pradesh Districts (Formation) Act, 1974. The number became 26 from 4 April 2022.



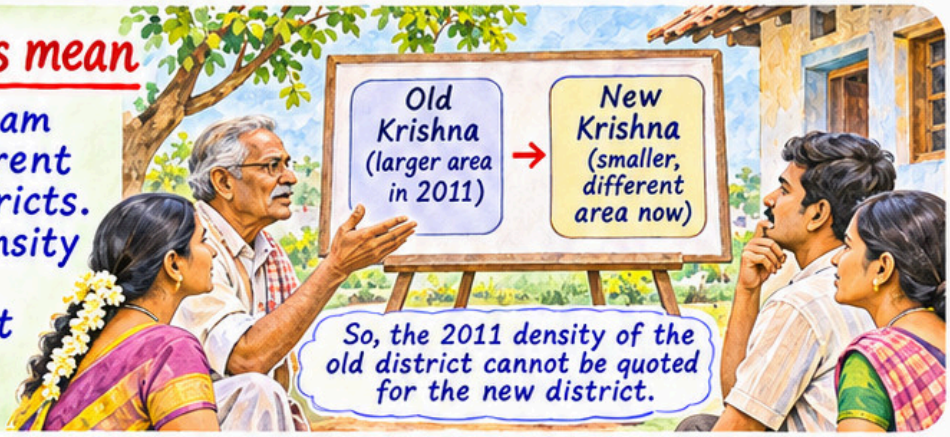
The later change

News reports say Markapuram and Polavaram districts were formed with effect from 31 December 2025, taking the total to 28. Keep this attribution attached.



What the old figures mean

Krishna and Visakhapatnam now cover smaller, different areas than their old districts. An old district's 2011 density cannot automatically be quoted for a new district with the same name.



The base used in these notes

All district population, density and growth figures use the 13-district recast table on a Census 2011 base, including the 2014 transfers. They are not figures for the later 26- or 28-district boundaries. A new district's 2011 population must be recalculated for its present area.



Source: Corrected Day 28 notes, pp. 29, 32 | @iaswithdrravi

Day 28 | Topic 275 | P04

Population growth is slowing

The State's growth series

1961-71: 18.88%.
1981-91: 21.13%.
2001-11: 9.21%, below India's 17.70%. The Socio-Economic Survey records a significant decline after 1981-91.



Do not fill gaps from another base

The Survey does not print 1971-81 or 1991-2001 growth for the present State's area. Do not borrow these from the undivided State's series. For 2001-11: present State 9.21%, undivided State 11.0%.



District extremes, 2001-11

13-district recast base: Kurnool grew fastest, 14.85%; West Godavari slowest, 3.58%. Vizianagaram, 4.23%, and East Godavari, 5.26%, also grew slowly.



Fertility behind the trend

The Technical Group report gives undivided Andhra Pradesh a TFR of 1.8 in SRS 2009-11. It lists 2004 as the year Andhra Pradesh reached replacement fertility of 2.1, while the State was still undivided.



Fertility and demographic transition

What TFR means

Total fertility rate is the average number of children a woman is expected to have during her reproductive years. Replacement level: 2.1.



NFHS: keep the round attached

Andhra Pradesh: NFHS-1 (1992-93), 2.6; NFHS-2 (1998-99), 2.3; NFHS-3 (2005-06), 1.8; NFHS-4 (2015-16), 1.8; NFHS-5 (2019-21), 1.7. The first three rounds cover the undivided State.



Recent comparisons

NFHS-5: AP 1.7, Telangana 1.8, India 2.0. NFHS-6 (2023-24): AP 1.8, India 2.0, reported in Lok Sabha on 24 July 2026. AP remains below replacement fertility.



SRS is a different series

AP: 1.6 in SRS 2017; the Technical Group assumes it will not fall below 1.5 in projections. India: 2.0 in SRS 2021, published May 2025. These years differ. Low fertility places AP in the late stage of demographic transition. NFHS and SRS are survey estimates, not Census counts.



Projections are not Census counts

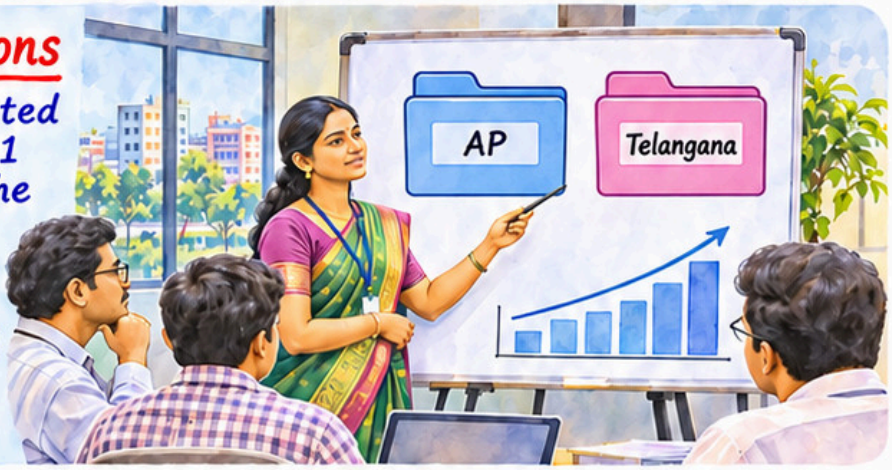
The Technical Group report

National Commission on Population, Ministry of Health and Family Welfare: Population Projections for India and States 2011–2036, dated November 2019. It starts from Census 2011 and uses SRS fertility estimates.



Separate State projections

AP and Telangana are projected separately using recast 2011 populations. Before 2014, the report uses combined SRS estimates of undivided AP; from 2014, separate State estimates. India is projected to rise from 121.1 crore in 2011 to 151.8 crore in 2036.



Assumptions, not enumeration

Projections depend on fertility, mortality and migration assumptions. The report urges caution. A projected figure is an estimate, never a Census count.



Census 2027

Houselisting and Housing Census was scheduled for April–September 2026. By 12 August 2026, it was completed in 31 States and Union territories. Population Enumeration in most of India is due in February 2027. It will be the first Census to count present AP separately; new figures will replace recast 2011 figures and projections.



Source: Corrected Day 28 notes, p. 30 | @iaswithdrravi

Day 28 | Topic 275 | P07

The five densest districts

13-district recast Census 2011 base, including 2014 transfers

Krishna

Population: 45,17,398.
Density: 518 persons per sq km.
Growth, 2001-11: 7.87%.



West Godavari

Population: 39,95,742.
Density: 470 persons per sq km.
Growth, 2001-11: 3.58%.



Srikakulam

Population: 27,03,114.
Density: 463 persons per sq km.
Growth, 2001-11: 6.52%.



Guntur

Population: 48,87,813.
Density: 429 persons per sq km.
Growth, 2001-11: 9.47%.



East Godavari

Population: 52,85,824.
Density: 413 persons per sq km.
Growth, 2001-11: 5.26%.



All five are coastal. East Godavari had the largest population but ranked fifth in density.

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District figures: middle densities

13-district recast Census 2011 base

Visakhapatnam

Population: 42,90,589.
Density: 384 persons per sq km.
Growth, 2001-11: 11.96%.



Vizianagaram

Population: 23,44,474.
Density: 359 persons per sq km.
Growth, 2001-11: 4.23%.
It had the smallest population among the 13 districts.



Chittoor

Population: 41,74,064.
Density: 275 persons per sq km.
Growth, 2001-11: 11.43%.



Kurnool

Population: 40,53,463.
Density: 230 persons per sq km.
Growth, 2001-11: 14.85%.
It had the fastest decadal growth among the 13 districts.



Size, density and growth measure different things. The most populous district need not be the densest or the fastest growing.

Source: Corrected Day 28 notes, pp. 31-32 | @iaswithdrravi

Day 28 | Topic 275 | P09

District figures: lower densities

13-district recast Census 2011 base

Sri Potti Sriramulu Nellore

Population: 29,63,557. Density: 227 persons per sq km. Growth, 2001-11: 11.05%.



Anantapur

Population: 40,81,148. Density: 213 persons per sq km. Growth, 2001-11: 12.10%.



Prakasam

Population: 33,97,448. Density: 193 persons per sq km. Growth, 2001-11: 11.05%.



YSR Kadapa

Population: 28,82,469. Density: 188 persons per sq km. Growth, 2001-11: 10.79%.

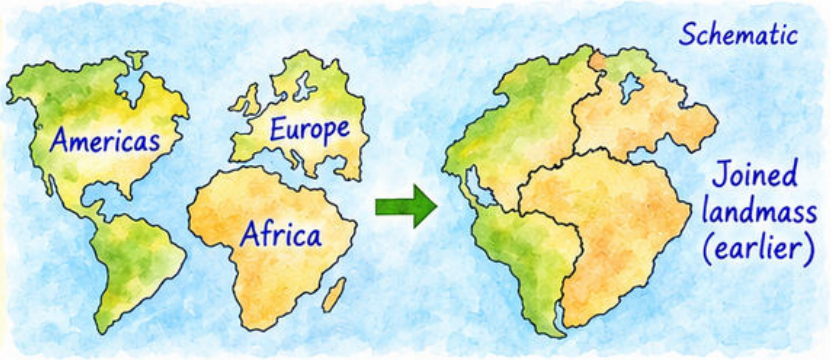


State total: 4,95,77,103 people; density 304; growth 9.21%. All four Rayalaseema districts, plus Prakasam, Nellore and Visakhapatnam, grew by more than 10%. West Godavari, Vizianagaram, East Godavari and Srikakulam grew by less than 7%.

From drifting continents to moving plates

Early recognition

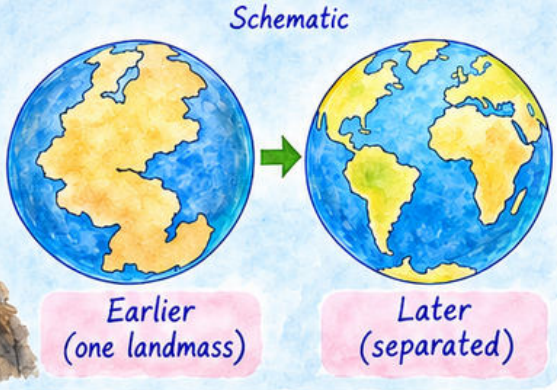
Abraham Ortelius suggested in 1596 that the Americas, Europe and Africa had once been joined. The matching Atlantic shapes prompted questions long before a mechanism was established.



Wegener's theory

German meteorologist Alfred Wegener presented continental drift in 1912 and published the full account in *The Origin of Continents and Oceans* in 1915. He proposed that continents had formerly belonged to one landmass and later separated.





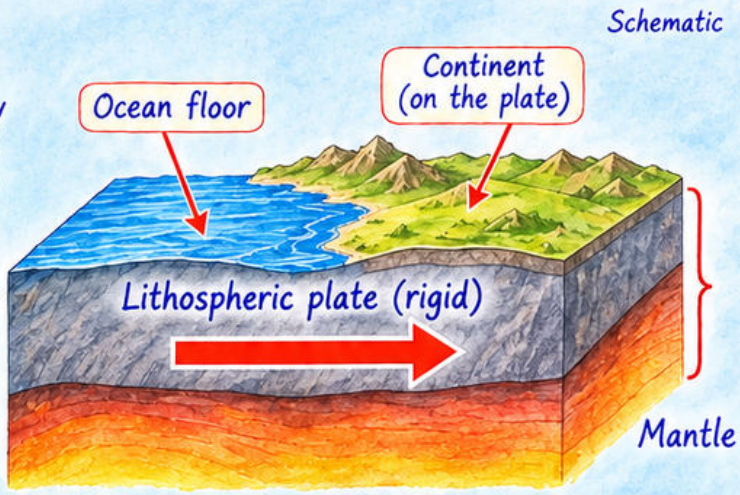
Steps towards a mechanism

Arthur Holmes discussed mantle convection in the 1930s. Harry Hess proposed sea-floor spreading in 1961. Bullard's computer fit of Atlantic margins followed in 1964. These developments strengthened the case for large-scale surface movement.



Plate tectonics, 1967

McKenzie and Parker, and independently Morgan, put forward the plate-tectonic concept. The crucial distinction is what moves: Wegener moved continents themselves; plate tectonics moves rigid lithospheric plates containing continents and ocean floor. Continental drift supplied an important idea, but lacked the later theory's adequate mechanism.

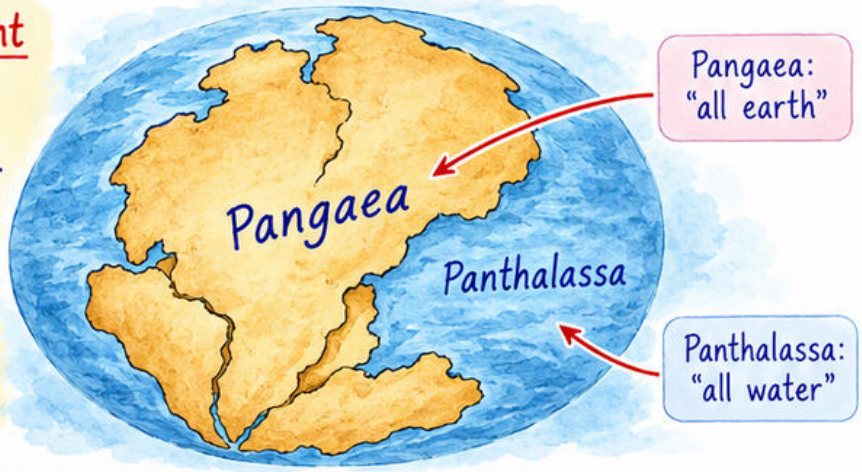


Sources: Day 29 Source Index | Topic 286

Pangaea was land Panthalassa was ocean

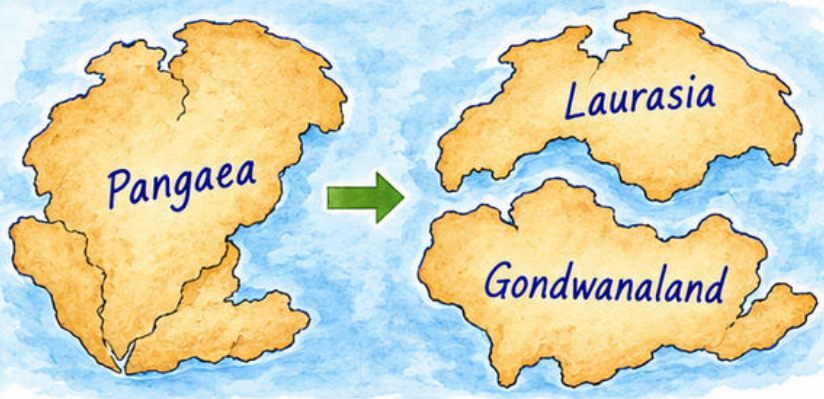
The original arrangement

Wegener's reconstruction joined the continents into Pangaea, meaning "all earth". A single surrounding mega-ocean was called Panthalassa, meaning "all water". These names refer to different parts of the reconstruction.



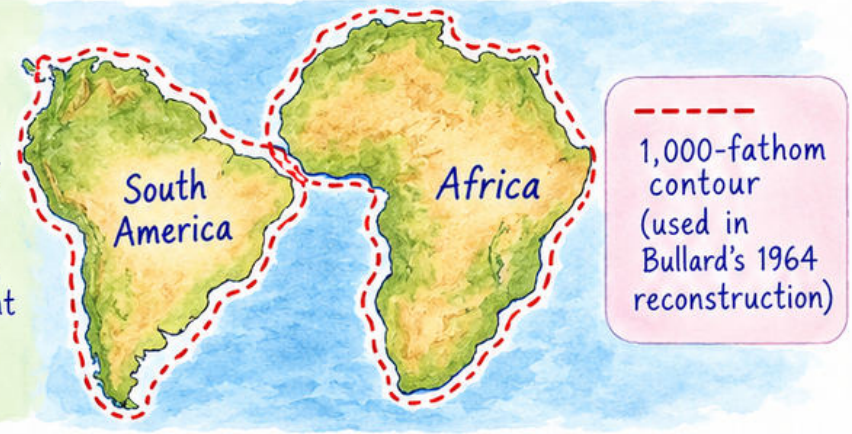
The breakup

Around 200 million years ago, Pangaea began separating into northern Laurasia and southern Gondwanaland. Later fragmentation and drift produced the separated landmasses. The Peninsular Plateau is associated with the breakup and movement of Gondwana land.



The Atlantic fit

The opposite sides of the Atlantic show a jigsaw correspondence. Bullard's 1964 computer reconstruction used the 1,000-fathom contour rather than today's shorelines. A margin-based fit is different from forcing every modern beach to match.



Why reconstruction needs evidence

A visual fit alone does not establish the entire history. Corresponding rocks, fossils and glacial deposits provide independent checks. The scientific argument combines several kinds of evidence rather than relying only on the familiar shape of South America and Africa.

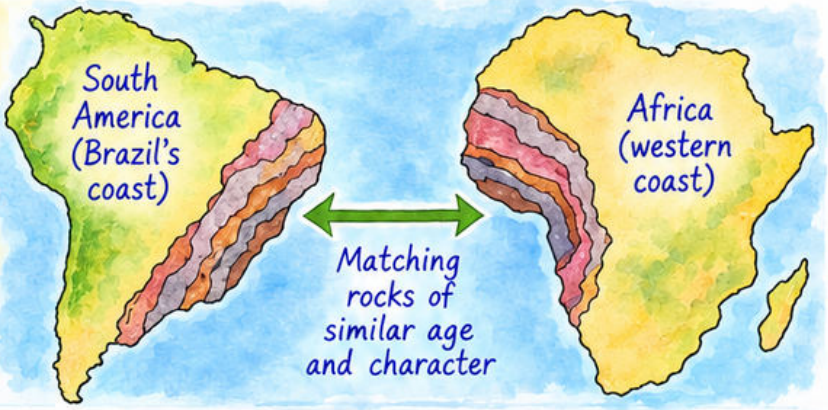


Sources: Day 29 Source Index | Topic 286

Rocks climate and gold connect continents

Matching ancient rocks

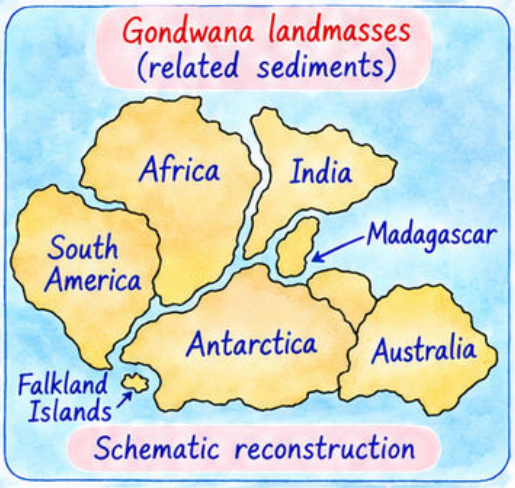
A belt of approximately 2,000-million-year-old rocks on Brazil's coast matches rocks in western Africa. Similar age and geological character across an ocean support reconstruction of formerly connected land.



Tillite as climate evidence

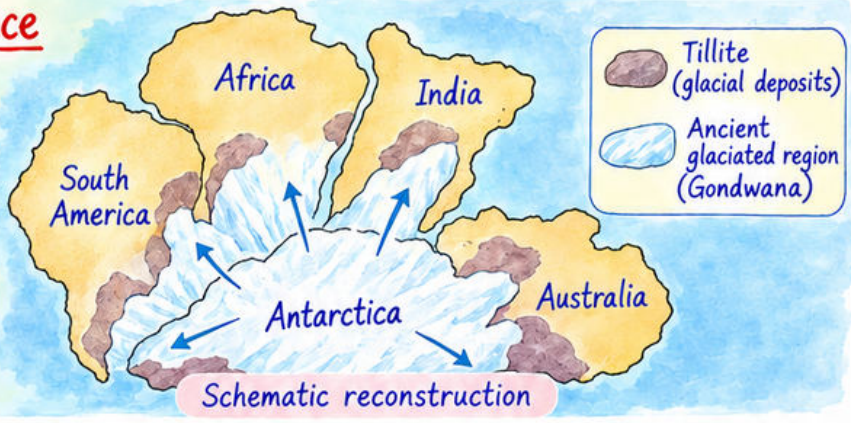
Tillite is a rock formed from glacial deposits and records past climates. Related Gondwana sediments link India with other Southern Hemisphere landmasses, including Africa, the Falkland Islands, Madagascar, Antarctica and Australia.





Reading glacial evidence

When glacial deposits on separated continents are reassembled with Gondwana, their distribution can be understood as parts of a connected ancient glaciated region. Tillite therefore adds climatic evidence to the correspondence of rocks and continental margins.



Placer deposits

The traditional drift argument links rich gold placer deposits on Ghana's coast with the Brazil plateau as their proposed source. This is an evidentiary interpretation within the continental-drift account. A placer is a concentration of valuable heavy material, and the key classroom connection is Ghana on one Atlantic side and Brazil on the other.

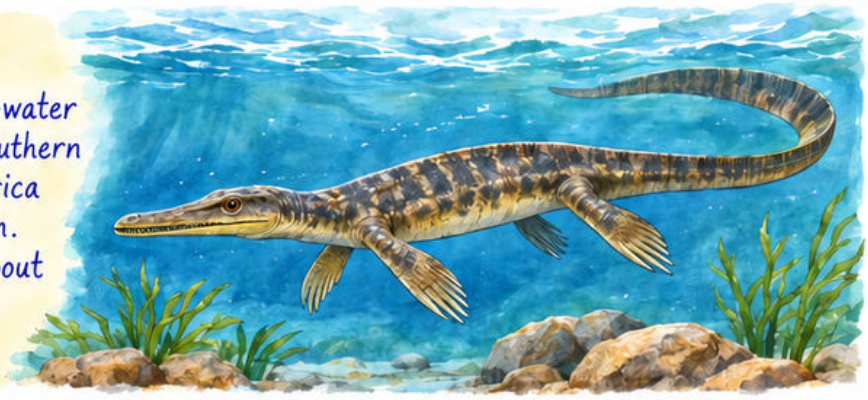


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Fossils preserve a former connection

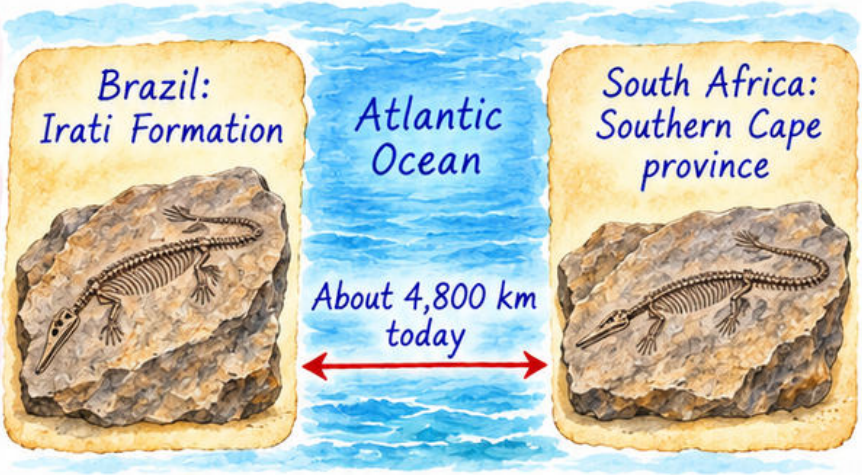
Mesosaurus

This small shallow-brackish-water reptile is recorded in the Southern Cape province of South Africa and Brazil's Irati Formation. The fossil areas are now about 4,800 km apart with the Atlantic between them.



Why this matters

A limited distribution in separated rock sequences raises a biogeographical question: how did related remains occur on opposite sides of an ocean? Former connection offers an explanation that can be tested alongside rock and climate evidence.



Lemurs and Lemuria

Nineteenth-century attempts to explain the distribution of lemurs and related forms led to the proposed connecting land called Lemuria. It was a historical biogeographical hypothesis, not a demonstrated continent or the modern explanation of plate movement.



Glossopteris

Glossopteris is a fossil seed fern used in reconstructing Gondwana. Its remains occur across now-separated southern landmasses, including Antarctica. Fossil distribution and changing palaeoclimate complement a coastline fit, but none by itself supplied Wegener with a satisfactory driving force.

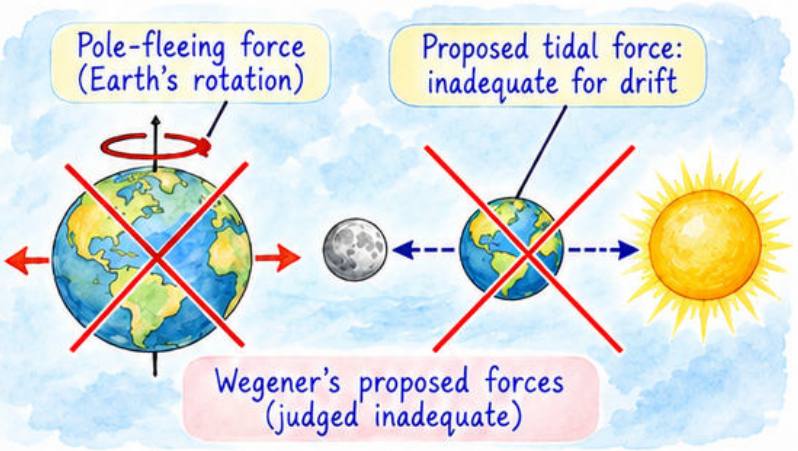


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Why Wegener's mechanism failed

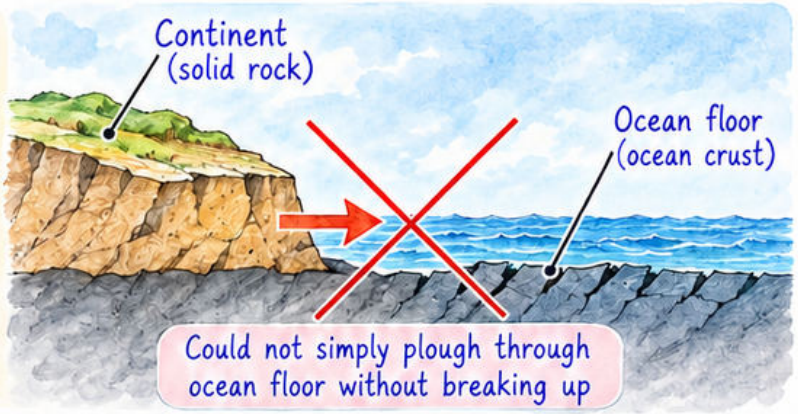
Two proposed forces

Wegener invoked pole-fleeing force associated with Earth's rotation, and tidal force associated with the attraction of the Moon and Sun. These were proposed causes, not the accepted modern mechanism.



The central objection

Most scholars judged those forces inadequate to move such large rock masses over great distances. Harold Jeffreys argued that solid continents could not simply plough through ocean floor without breaking up.



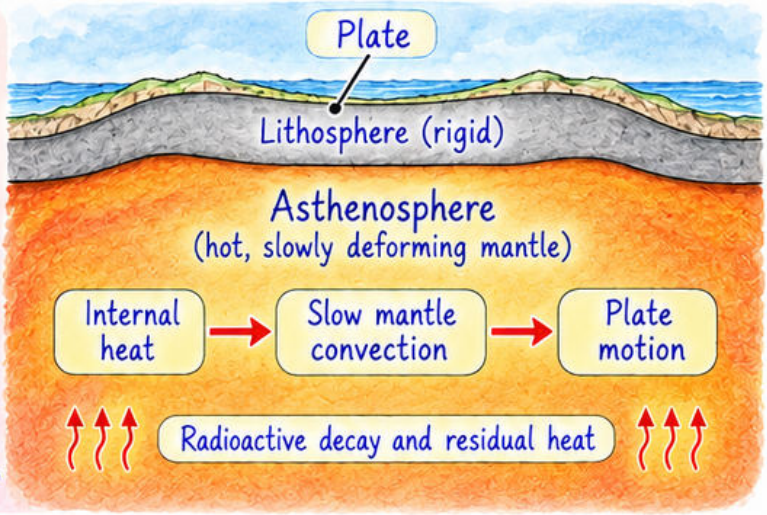
Rejection and revival

By about 1930, most geologists had dismissed the theory's driving explanation. The drift idea was revived within plate tectonics in the 1960s after new evidence and mechanisms emerged. Weakness of a proposed mechanism did not erase the matching geological evidence.



Holmes and convection

In the 1930s, Arthur Holmes discussed mantle convection driven by thermal differences associated with radioactive elements. Modern plate motion is linked to slow movement of hot, softened mantle in convection cells, with radioactive decay and residual heat as energy sources. Plates move over the asthenosphere rather than continents cutting independently through ocean crust.

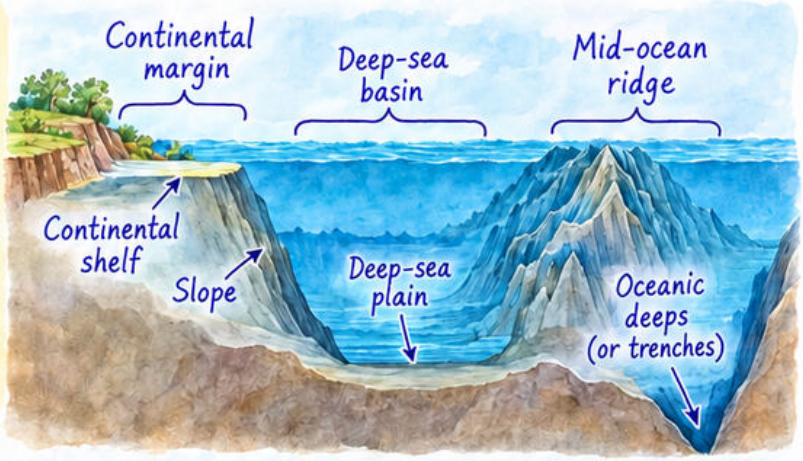


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New crust forms at ocean ridges

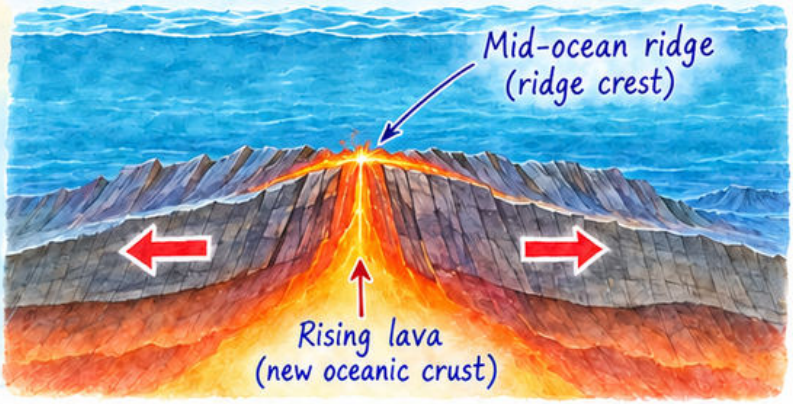
The ocean-floor framework

The plate-tectonics account groups the ocean floor into continental margins, deep-sea basins and mid-ocean ridges. A fuller relief description distinguishes continental shelf, slope, deep-sea plain and oceanic deeps or trenches, with ridges as another feature.



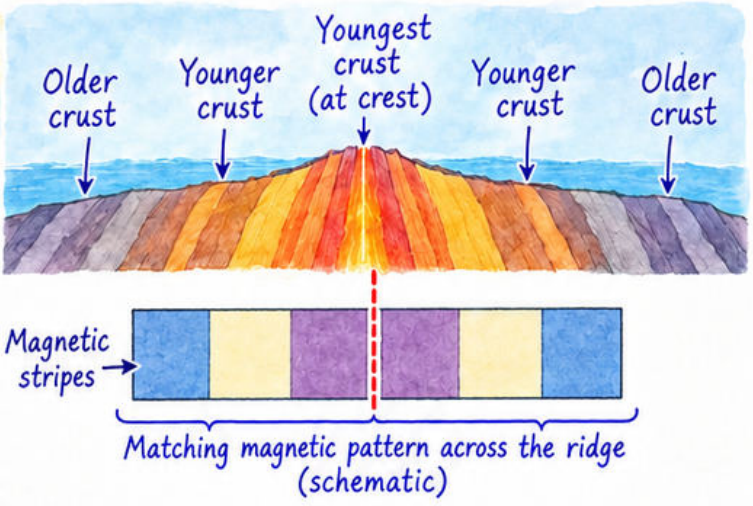
Hess's explanation, 1961

Repeated eruptions at ridge crests bring up lava and create new oceanic crust. The new material pushes the crust on either side apart. Mid-ocean ridges are major active volcanic zones.



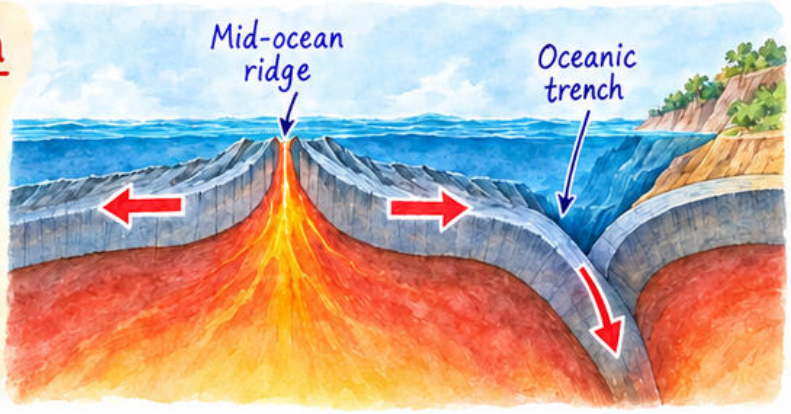
Symmetry across the ridge

Rocks equally distant from a ridge crest on opposite sides are similar in age and composition. The youngest crust lies near the crest; progressively older crust occurs outward on both sides. Magnetic stripes record repeated reversals of Earth's magnetic field.



Creation and consumption

Ocean floor moving away from ridges is consumed where it sinks at oceanic trenches. Spreading does not require an ever-growing Earth: its size is thought to have changed little, if at all, since formation.

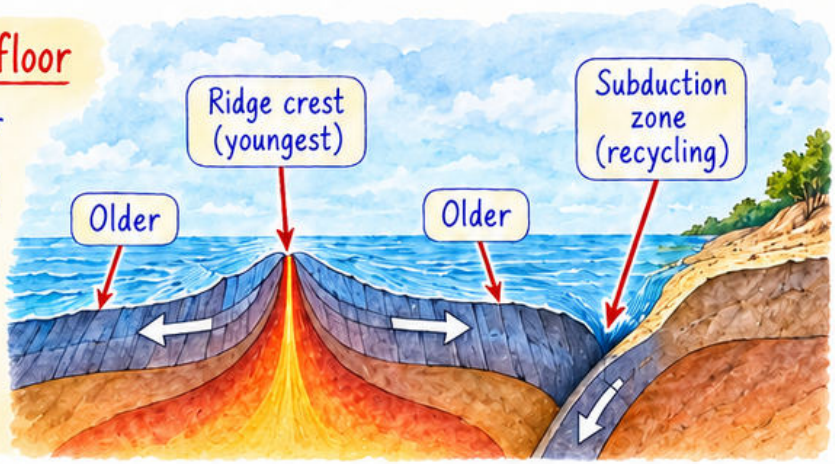


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Oceanic and continental rock ages

A young, recycled ocean floor

Most oceanic crust is younger than about 200 million years. New crust forms at mid-ocean ridges and older oceanic lithosphere is recycled at subduction zones. The ridge crest is youngest; crust becomes older away from it.



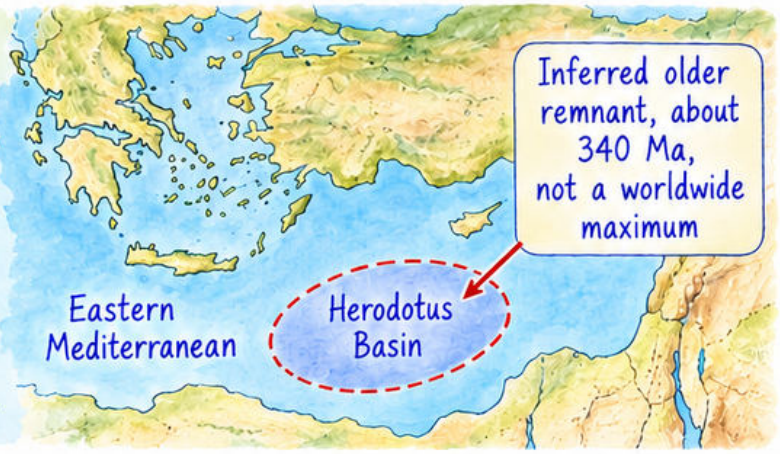
Very ancient continental rocks

Continents preserve rocks billions of years old. Some formations are at least 3,200 million years old, and the oldest surviving continental rocks approach four billion years. Continental and oceanic crust therefore preserve very different age records.



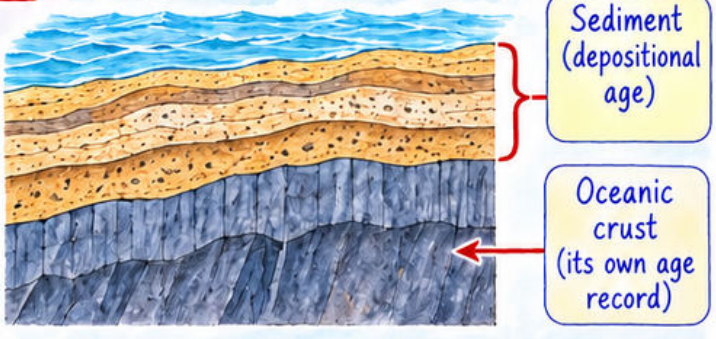
Older oceanic remnants

Older oceanic remnants can survive. Magnetic evidence from the Herodotus Basin in the eastern Mediterranean has been interpreted as crust formed about 340 million years ago. This is a regional inferred age, not a new worldwide upper limit.



Sediments are a separate record

Sediment accumulates above the crust. The age of a sediment layer and the age of the underlying crust are different measurements. No single universal 200-million-year ceiling should be applied to every marine sediment record.

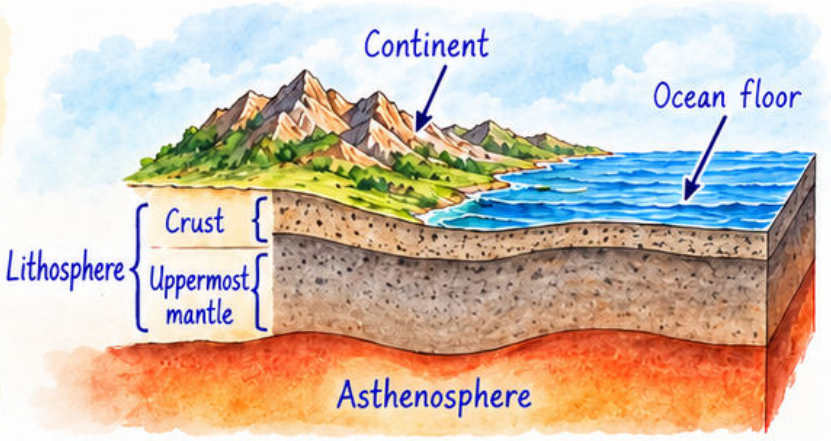


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Lithospheric plates move as rigid units

What a plate contains

A plate is a massive, irregular slab of solid rock. The lithosphere comprises the crust and uppermost mantle, not the crust alone. It is divided into plates that move horizontally as rigid units over the asthenosphere.



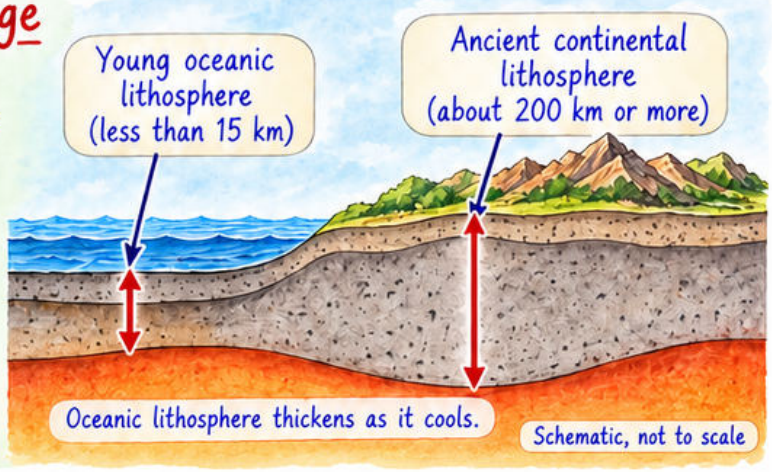
Continental or oceanic

The label depends on which type occupies most of the plate. A continental plate may include substantial ocean floor. A plate boundary therefore need not coincide with a coastline or national border.



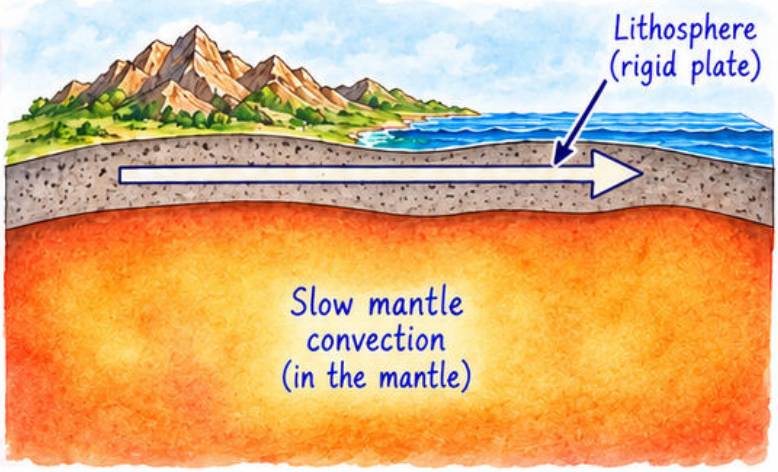
Thickness changes with age

Lithospheric thickness varies greatly: young oceanic lithosphere can be less than 15 km thick, while ancient continental lithosphere can reach about 200 km or more. Oceanic lithosphere thickens as it cools. These are plate thicknesses, including crust and uppermost mantle, not crustal thickness alone.



The moving unit

Continents form parts of plates, so the whole plate moves. Heat from radioactive decay and residual internal heat supports slow mantle convection beneath the rigid surface. This distinction replaces the idea of continents independently forcing their way through a stationary ocean floor.

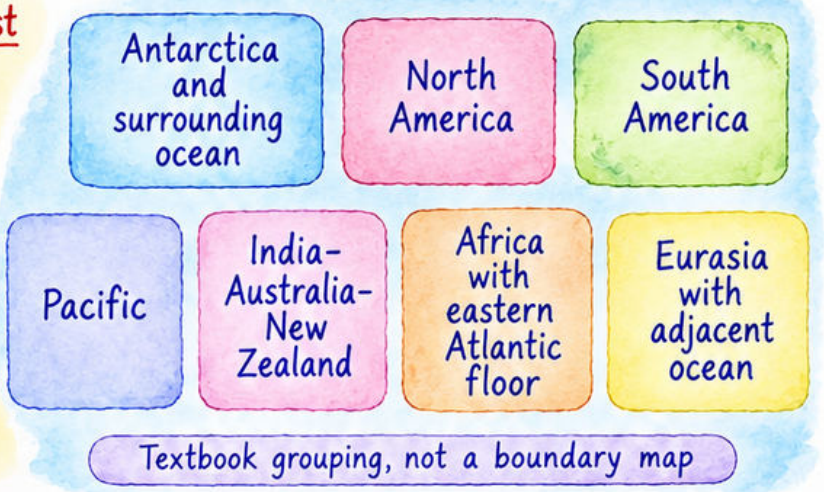


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Seven major plates and smaller neighbours

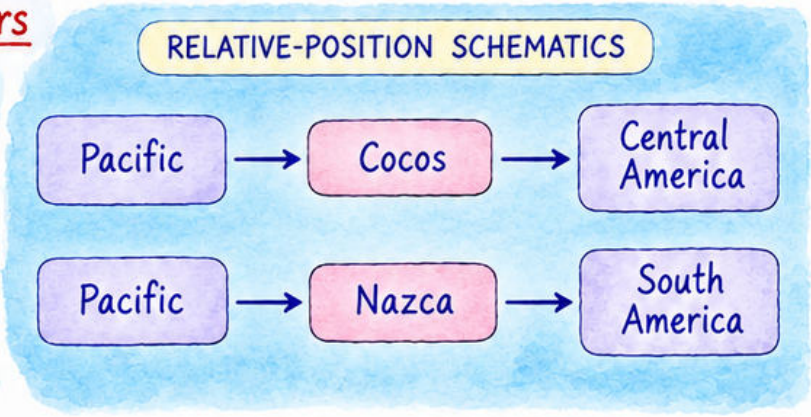
The seven in the textbook list

The list comprises Antarctica and surrounding ocean; North America; South America; Pacific; India-Australia-New Zealand; Africa with the eastern Atlantic floor; and Eurasia with adjacent ocean. This is the textbook's grouping, not a claim that every scientific plate model uses identical divisions.



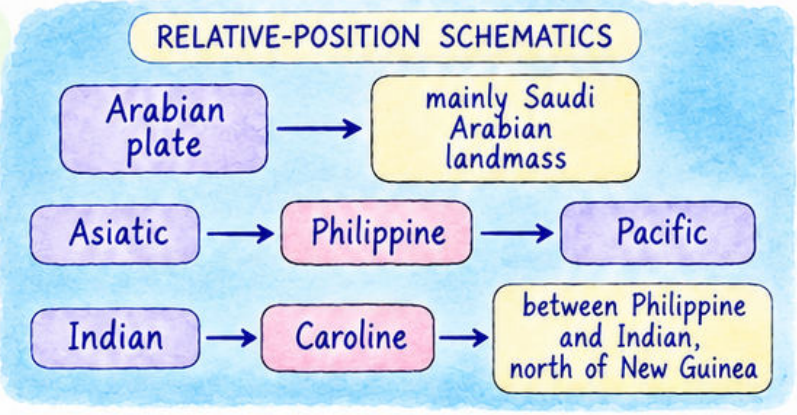
Eastern Pacific neighbours

The Cocos plate lies between Central America and the Pacific plate. Nazca lies between South America and the Pacific plate. Their positions matter when interpreting subduction and mountain-building examples.



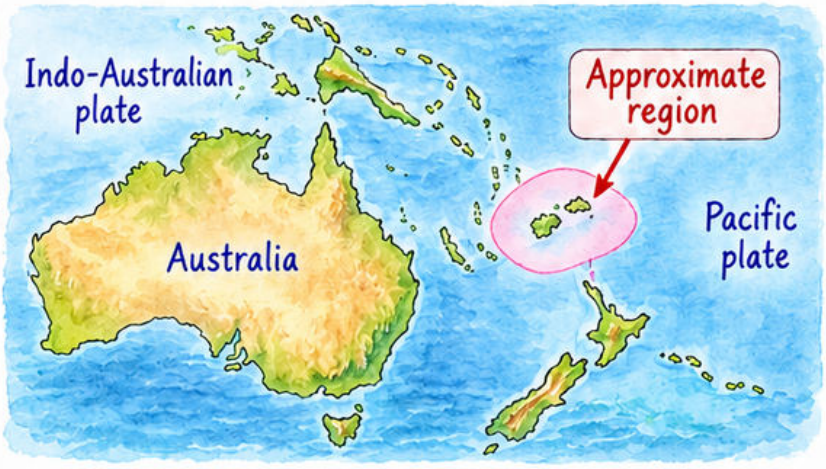
Asian-Pacific neighbours

The Arabian plate consists mainly of the Saudi Arabian landmass. The Philippine plate lies between the Asiatic and Pacific plates. Caroline lies between the Philippine and Indian plates, north of New Guinea.



The Fiji microplate

Fiji lies in the complex southwestern Pacific boundary region between the Pacific and Indo-Australian plates, northeast of Australia. Geological accounts identify a Fiji microplate. The wider region contains several smaller plates, so their exact boundaries depend on the model used.

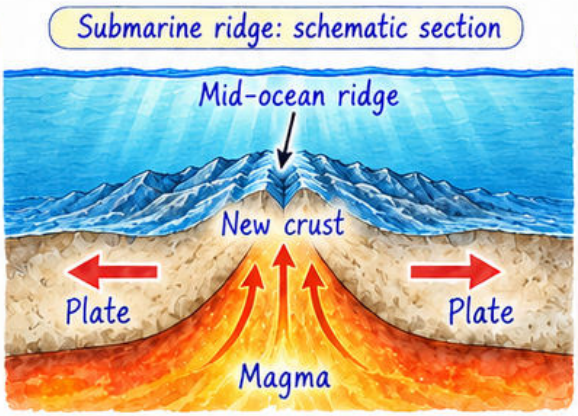


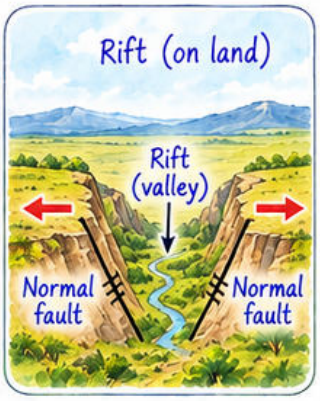
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Divergent plates create new crust

The motion

At divergent boundaries, plates pull away from each other and new crust forms. These are spreading sites. A mid-ocean ridge is the characteristic oceanic feature; on land, a rift may open.

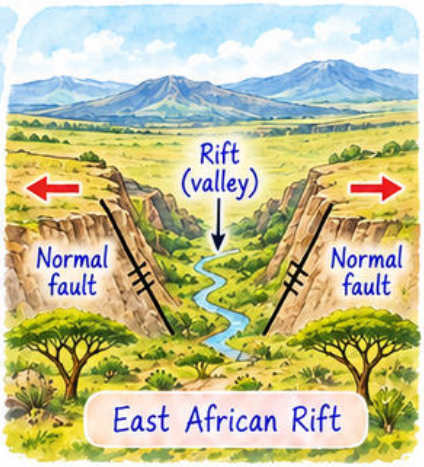




Examples

The Mid-Atlantic Ridge is the standard example. Iceland straddles the spreading centre between the North American and Eurasian plates. The East African Rift illustrates a region where a new spreading centre may be developing.





Slow and fast spreading

The textbook gives the Arctic Ridge as the slowest, below 2.5 cm per year, and the East Pacific Rise near Easter Island as the fastest, above 15 cm per year. Easter Island lies in the South Pacific about 3,400 km west of Chile.

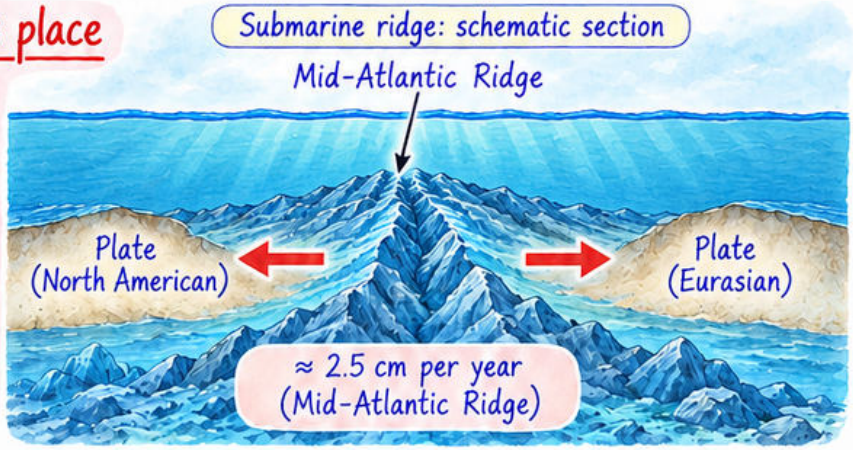
Arctic Ridge	< 2.5 cm per year
Mid-Atlantic Ridge	≈ 2.5 cm per year
East Pacific Rise	> 15 cm per year



Easter Island lies in the South Pacific about 3,400 km west of Chile.

Read each rate with its place

USGS gives the Mid-Atlantic Ridge's average spreading as about 2.5 cm per year. A rate belongs to a specified ridge or segment and a stated measure; it should not be used as the speed of every plate. Centimetres per year accumulate into major continental movement over geological time.

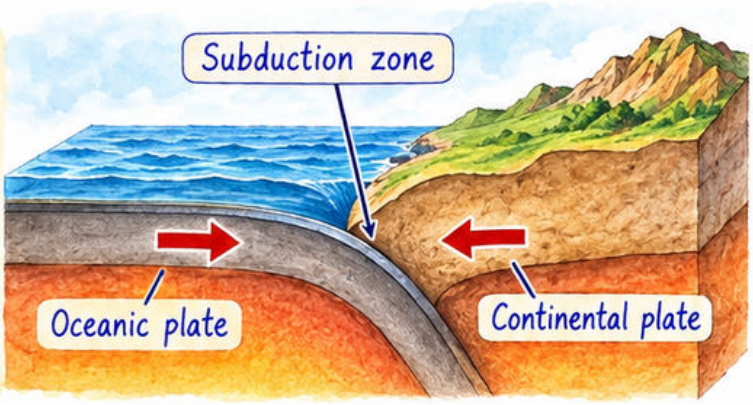


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Convergent boundaries build trenches and mountains

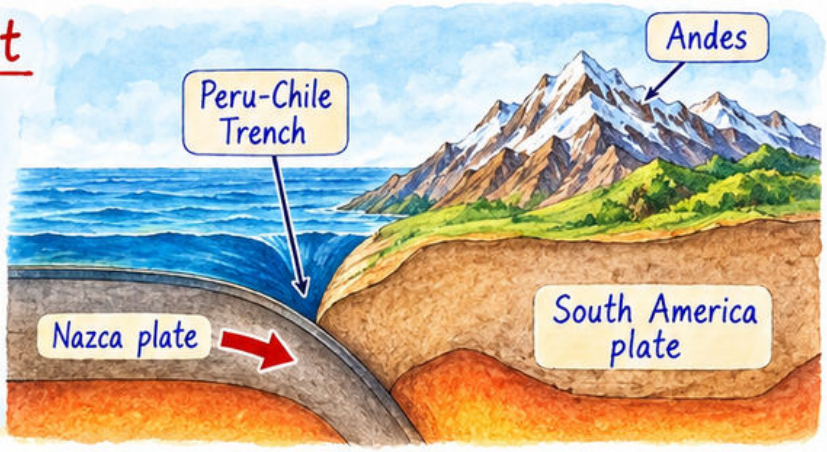
Plates approach

At convergent boundaries, plates move towards each other. Where one plate descends beneath another, the sinking region is a subduction zone. The textbook distinguishes ocean-continent, ocean-ocean and continent-continent convergence.



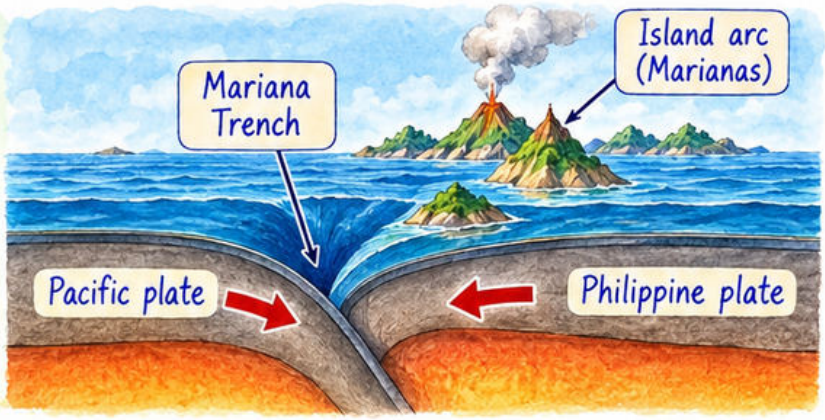
Ocean meets continent

The Nazca plate subducts beneath South America. This is associated with the Andes and the offshore Peru-Chile Trench. Match the oceanic plate, mountain chain and trench as one example.



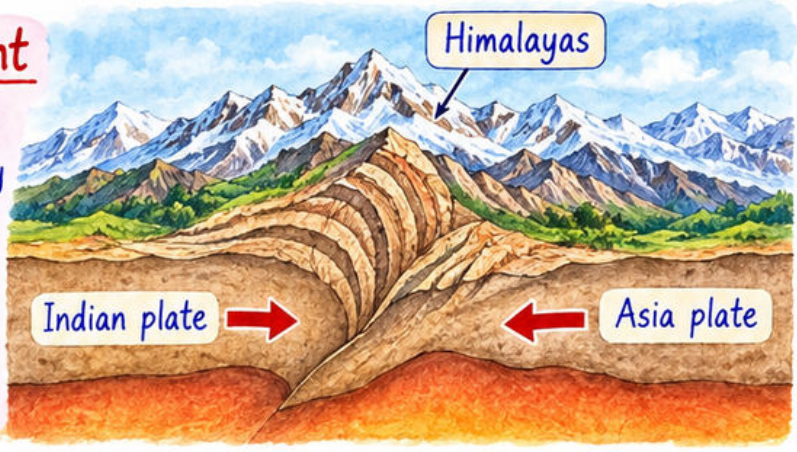
Ocean meets ocean

The Pacific plate converges against the Philippine plate at the Mariana Trench. Oceanic convergence produces trench and island-arc systems; the Marianas and Aleutians are examples of island arcs.



Continent meets continent

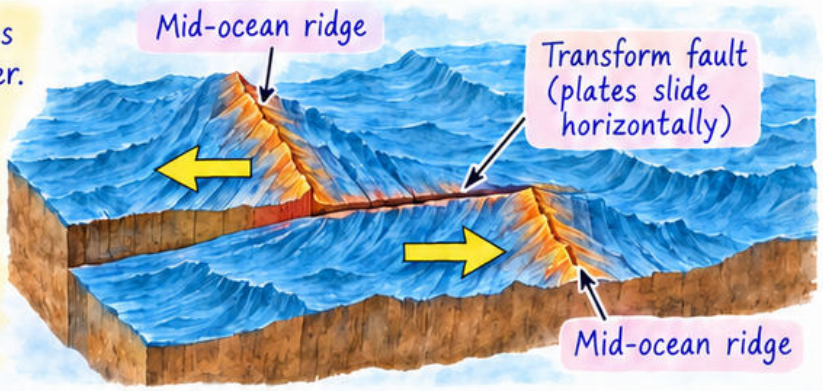
The Himalayas formed at the Indian plate's northern boundary through collision with Asia. Mountain-building here is a continent-continent convergence example.



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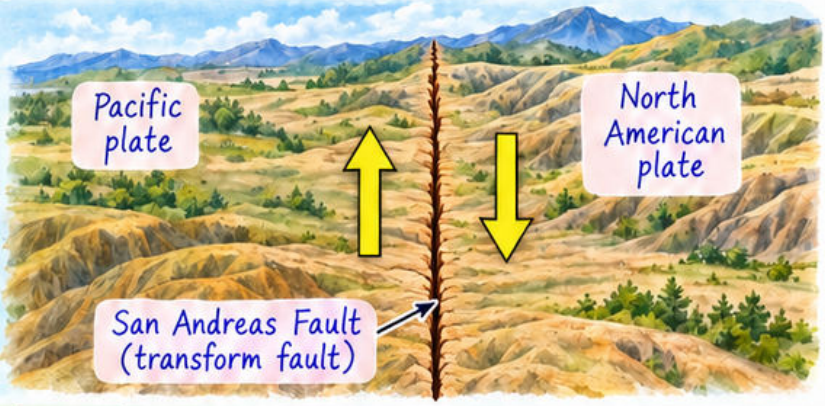
Transform faults and broad boundary zones

At a transform boundary, plates slide horizontally past each other. Crust is neither created nor destroyed by that boundary motion. Transform faults are planes of separation, commonly perpendicular to mid-ocean ridges.



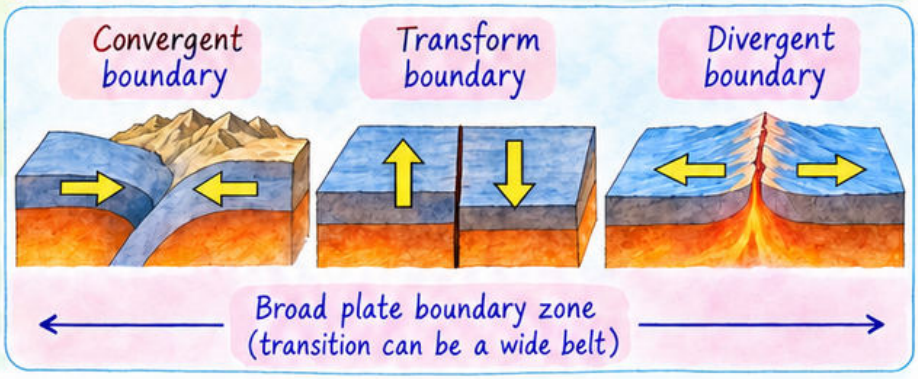
San Andreas

The San Andreas Fault separates the Pacific and North American plates. USGS describes the Pacific plate as grinding past North America there for about 10 million years. The example belongs to transform motion, not to a spreading ridge.



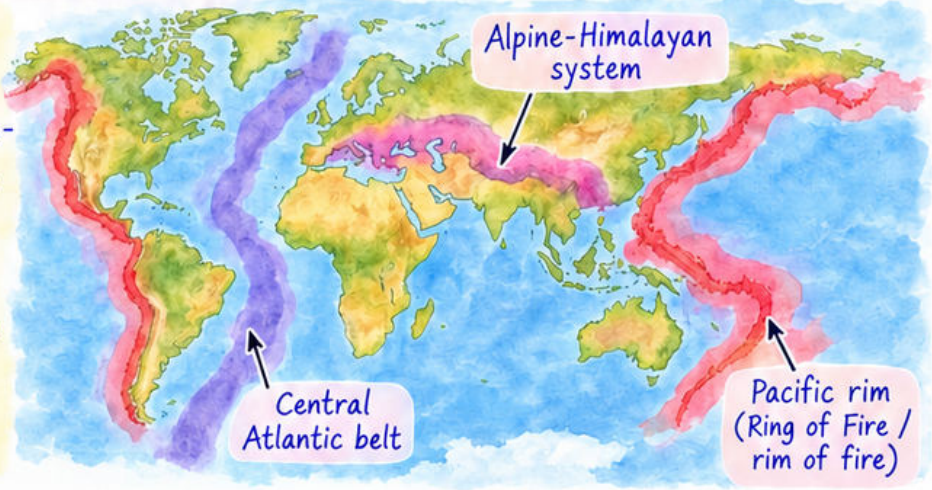
Some boundaries are broad

USGS also recognises plate boundary zones where limits are not sharply defined. A simple three-type diagram is useful, but the real transition can be a broad belt rather than a single clean line.



Earthquake and volcano belts

Activity follows a central Atlantic belt and the Alpine-Himalayan system and Pacific rim. The circum-Pacific belt is the Ring of Fire, also called the rim of fire. The concentration of earthquakes and volcanoes supports the association between active deformation and plate margins, though the two phenomena should not be drawn as identical at every boundary.

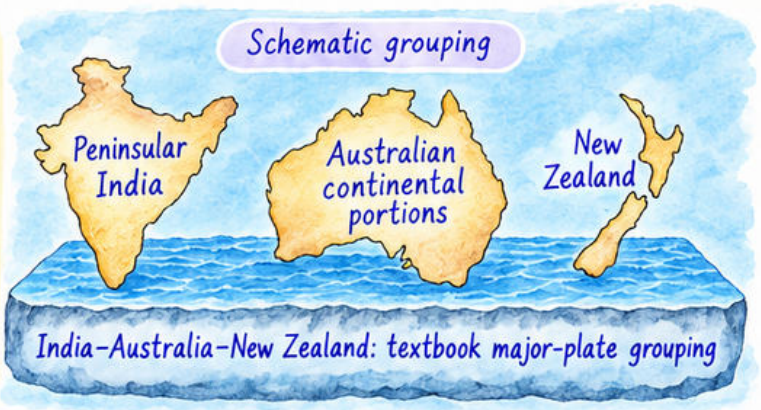


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The Indian plate and its boundaries

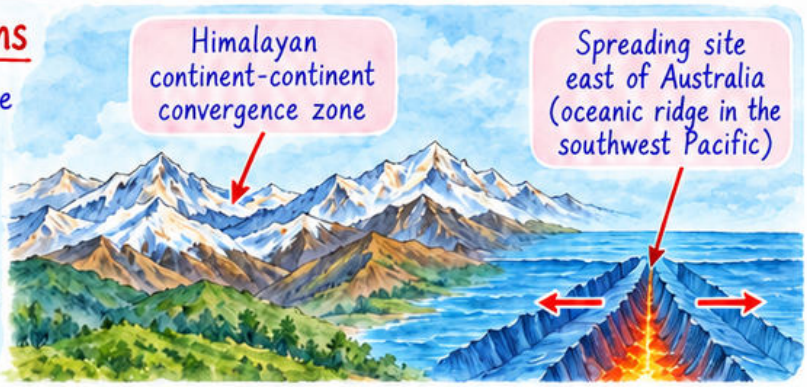
More than Peninsular India

In the textbook classification, the Indian plate includes Peninsular India and the Australian continental portions, within the India-Australia-New Zealand major plate. Political outlines do not define lithospheric plates.



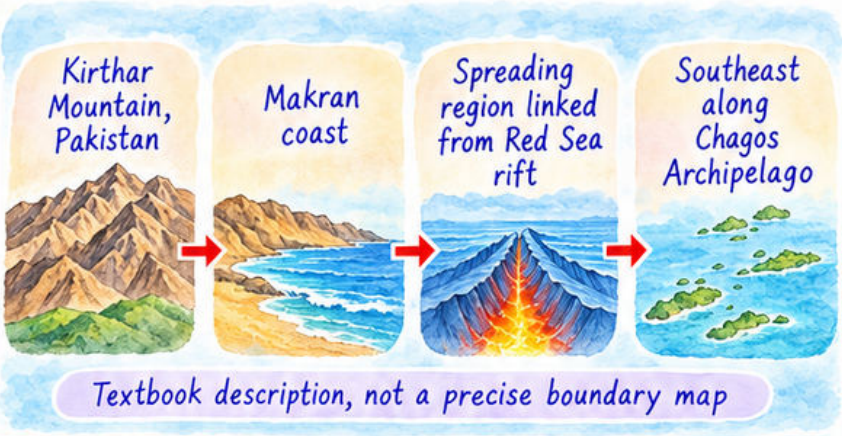
Northern and eastern margins

The northern boundary follows the Himalayan continent-continent convergence zone. The eastern boundary is described as a spreading site east of Australia, an oceanic ridge in the southwest Pacific.



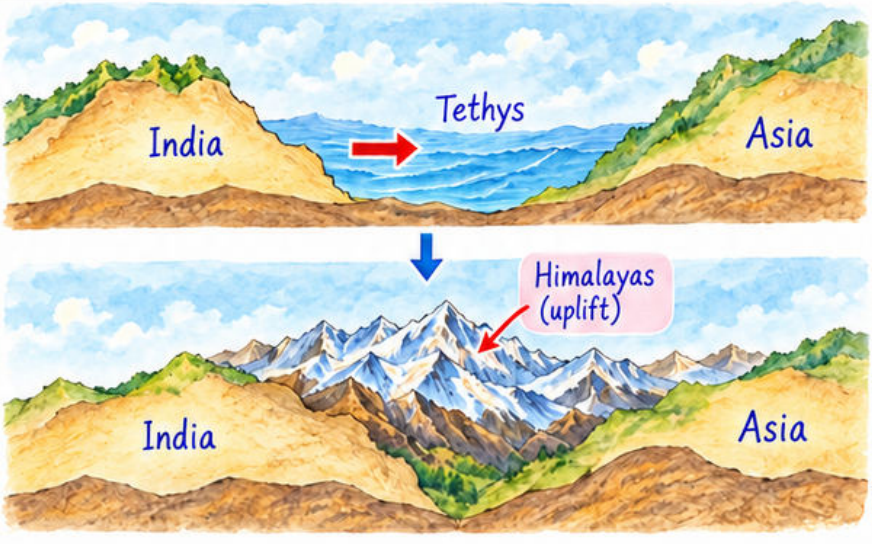
The western margin

The textbook traces it along Pakistan's Kirthar Mountain and the Makran coast, written "Makrana" in that account, then towards the spreading site linked from the Red Sea rift southeast along the Chagos Archipelago.



The broad journey

India moved north across the Tethys towards Asia. Collision around 40–50 million years ago caused rapid Himalayan uplift; USGS uses about 50 million years or 40–50 million years in its accounts. Himalayan development from about 40 million years ago to the present continues.



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India moves from Gondwana towards Asia

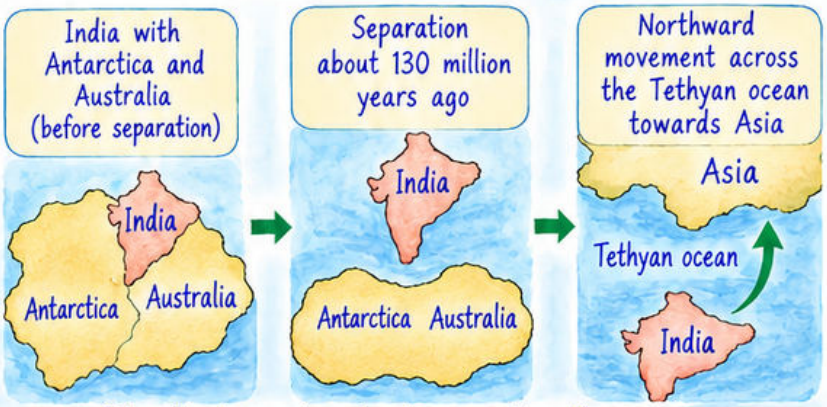
Part of Gondwana

India was part of Gondwana within Pangaea, not a freely isolated island at 225 million years ago. Pangaea began to break apart about 200 million years ago, while India remained within eastern Gondwana alongside Antarctica and Australia.



Separation and northward movement

Gondwana broke up in stages. Seafloor spreading separated India from Antarctica and Australia about 130 million years ago. India then travelled north across the Tethyan ocean towards Asia. The journey took tens of millions of years.



Schematic stages, not exact palaeogeographic outlines

The Deccan flood basalts

The main phase of Deccan Traps eruptions occurred around 66 million years ago, while India lay near the equatorial belt. The voluminous main sequence erupted over roughly one million years. Some peripheral volcanic activity was earlier or later; 60 million years ago is not the start of the main Deccan phase.



Collision and the Himalayas

India collided with Asia around 50 million years ago, commonly summarised as about 40–50 million years. Continental collision thickened and uplifted the crust to build the Himalayas. Convergence and mountain-building continue today.



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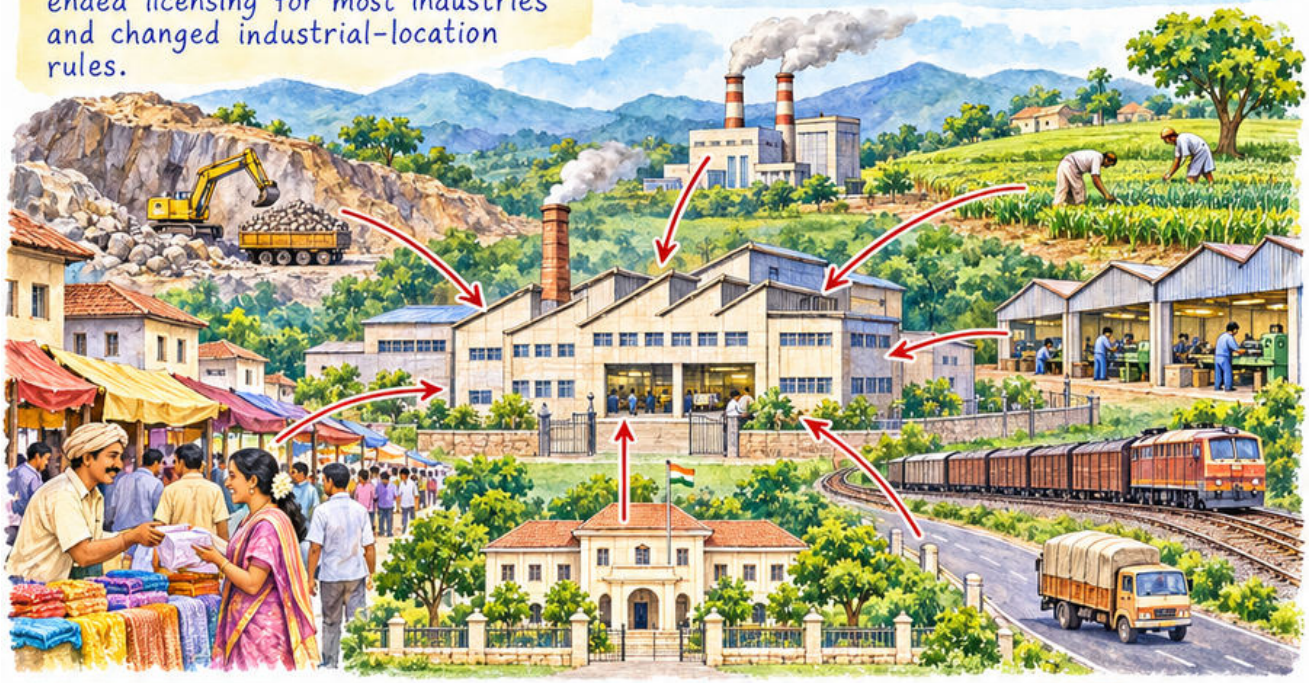
Why factories choose different places

The least-cost objective

Industrial location means choosing where a manufacturing unit will be established. Industries seek higher profits by reducing costs, so location is guided by the place where production costs are lowest. India's Industrial Policy of 1991 ended licensing for most industries and changed industrial-location rules.

Seven location factors

The main factors are access to markets, raw materials, labour, energy, transportation and communication, government policy, and agglomeration economies. Different industries place different weights on these factors; no single factor explains every factory.



Market access

A market contains people who want the goods and have purchasing power. It is the most important general factor in industrial location. Densely populated South and South-east Asia provides a large market; aircraft and arms industries serve global markets. A large population alone is not the complete definition of a market.



Transport and communication

Modern industry depends on transport systems to move materials and products. Communication allows information to be exchanged and managed. Highly developed transport helps explain industrial concentration in western Europe and eastern North America.



Government policy

Regional policies can encourage balanced economic development. Public-sector industries and joint-sector ventures have been located in tribal and backward areas to reduce regional disparities. A location influenced by policy may therefore differ from the site suggested by raw-material or market access alone.



Sources: Day 30 Source Index | Topic 294

Raw materials and energy pull factories

Close to the raw material

Cheap, bulky, weight-losing inputs pull factories towards their source: steel, sugar and cement are standard examples. Perishable inputs also need nearby processing, as with farm produce and milk used in agro-processing and dairy products.



Sugarcane is bulky and perishable. Its sucrose content falls during haulage and after time has passed, so sugar mills stand near cane fields. The reason combines transport cost with loss of usable sugar, not distance alone.



Towards the market

Products that gain weight during manufacture, for example by adding locally available water, may favour the market. In Weber's model, material index above 1 points towards the source; below 1 points towards the market. Exactly 1 needs a separate test rather than automatic assignment to either group.



Power-intensive aluminium

Aluminium smelting needs a regular electricity supply and assured raw material at minimum cost. Bauxite is very bulky. Smelters occur in Odisha, West Bengal, Kerala, Uttar Pradesh, Chhattisgarh, Maharashtra and Tamil Nadu.



Energy and labour change

Coal was formerly the main energy source; hydroelectricity and petroleum also became important. Some manufacturing still needs skilled labour, while textiles, leather and food processing require substantial labour. Mechanisation, automation and flexible production have reduced dependence on labour, but have not made labour irrelevant.



Sources: Day 30 Source Index | Topic 294

Clusters and footloose industries

Jute mills beside the Hugli

The Hugli jute cluster benefits from nearby jute-producing areas, cheap labour from West Bengal, Bihar, Odisha and Uttar Pradesh, inexpensive water transport supported by railways and roads, and abundant water for processing raw jute.



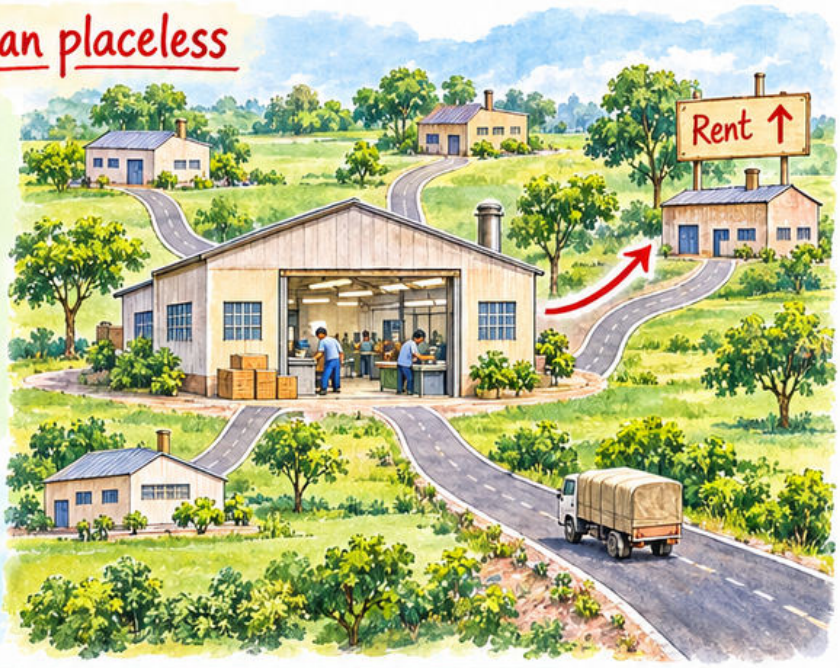
Kolkata adds shared banking, insurance and port facilities for exporting jute goods. This illustrates agglomeration economies: industries gain from being close to a leading industry and to one another. Linkages save costs; one industry's finished goods may become another's raw material.



Do not confuse the gain with crowding costs. Weber's translator separately described deglomerating factors, including rising land rent associated with industrial concentration, which can pull firms apart.

Footloose does not mean placeless

Footloose industries can operate in many different places. They are not tied to any specific raw material, whether weight-losing or otherwise, and largely use components obtainable anywhere. They produce small quantities, employ a small labour force and are generally non-polluting.



Accessibility by the road network remains important. Freedom from a particular raw-material deposit does not remove the need for good access.

NIOS gives mobile manufacturing and computer-chip production as examples. NCERT gives the defining features but no named example. Preserve that distinction when a question asks specifically for an example given by NCERT rather than by another textbook.

Sources: Day 30 Source Index | Topic 294

Classify industries by size and material

Size of the production unit

Household or cottage industry is the smallest unit, run by artisans at home. Small-scale industry uses a workshop outside the home, simple power-driven machines and semi-skilled labour. Large-scale industry is the third size category.



The basis is size, so a cottage unit and a large factory can still use the same kind of raw material. Do not treat size and material as competing names for one classification.

Agro-based industries

These process agricultural products. Examples are sugar, fruit juices and textiles.



Mineral-based industries

Ferrous industries include iron and steel. Non-ferrous industries include aluminium and copper. Non-metallic mineral industries include cement and pottery. Mineral-based does not mean metal-based only.



Chemical-based industries

Examples are petrochemicals, synthetic fibre and plastic. Synthetic fibre therefore belongs here in this raw-material classification, even though textiles also appear among agro-based examples.



Forest-based industries

Examples are furniture, paper and lac, using forest materials.



Animal-based industries

Examples are leather and woollen textiles, using animal-derived materials.



Read the classification basis first

A product name can appear under different bases. Paper is forest-based by input, while it also appears among consumer goods by output. A classification question is answered by matching the stated basis, not by assuming that every industry has only one permanent label.



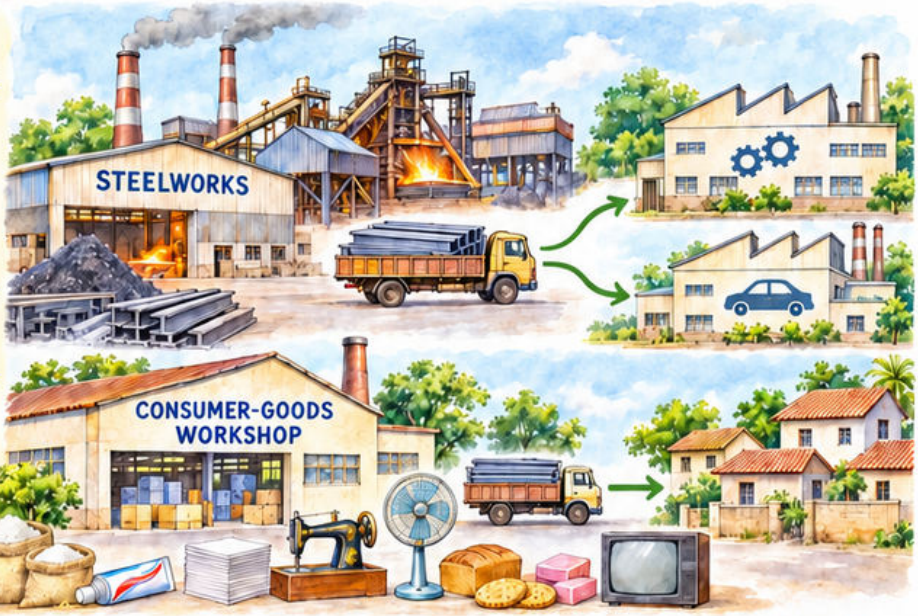
Sources: Day 30 Source Index | Topic 294

Classify output ownership and weight

Output or main role

Basic or key industries provide materials that support other industries. Examples are iron and steel, copper smelting and aluminium smelting.

Consumer-goods industries make goods used by consumers. Examples include sugar, toothpaste, paper, sewing machines and fans, as well as bread, biscuits, soaps and televisions.



Ownership

Public-sector examples are BHEL and SAIL. Private-sector examples are TISCO, Bajaj Auto Ltd. and Dabur Industries.

Joint-sector enterprises are owned jointly by the public and private sectors. The textbook example is Oil India Ltd., or OIL.

Cooperative examples are the sugar industry in Maharashtra and the coir industry in Kerala. Keep cooperative ownership distinct from joint public-private ownership.

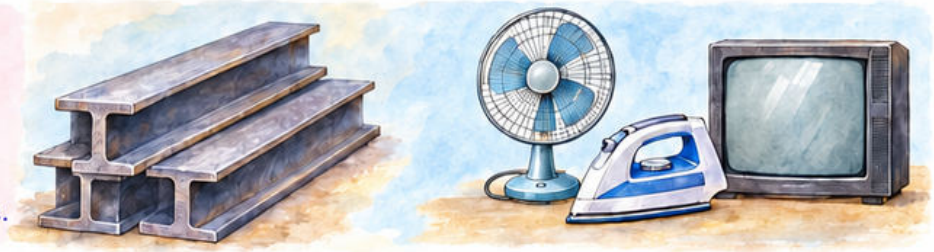


Public-sector | Private-sector

Joint-sector (textbook example) | Cooperative

Bulk and weight

Heavy industry is illustrated by iron and steel; light industry by electrical goods. This basis concerns bulk and weight, not whether the enterprise is public or private.



Use all five bases correctly

Size, raw material, output or main role, ownership, and bulk or weight ask different questions about an industry. Iron and steel appears as mineral-based by raw material, basic or key by role, and heavy by bulk and weight. Sugar appears as agro-based by input and consumer goods by output; Maharashtra's cooperative sugar industry also illustrates ownership. Multiple correct classifications can coexist when their bases differ.



Mineral-based (raw material)

Basic or key (output or main role)

Heavy (bulk or weight)



Agro-based (raw material)

Consumer goods (output or main role)

Cooperative (ownership)

Sources: Day 30 Source Index | Topic 294

Weber and the material index

Origin and objective

Alfred Weber wrote Über den Standort der Industrien in 1909. Carl J. Friedrich's English edition, Alfred Weber's Theory of the Location of Industries, appeared in 1929. The theory's origin is 1909, not the translation date.

Least-cost theory seeks the factory site with minimum production costs. Its three factors are transport costs, labour costs and agglomeration. Transport is the main influence; labour and agglomeration adjust the least-transport-cost site.





Two distinctions between materials

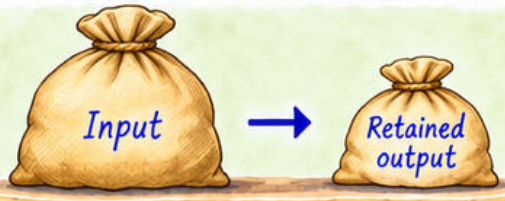
Localised materials occur only in particular places. Ubiquities, such as water in the model, are available everywhere.

A pure material enters the finished product with all its weight. A weight-losing material contributes only part of its original weight to the product.

Pure material: all weight retained



Weight-losing material: part retained

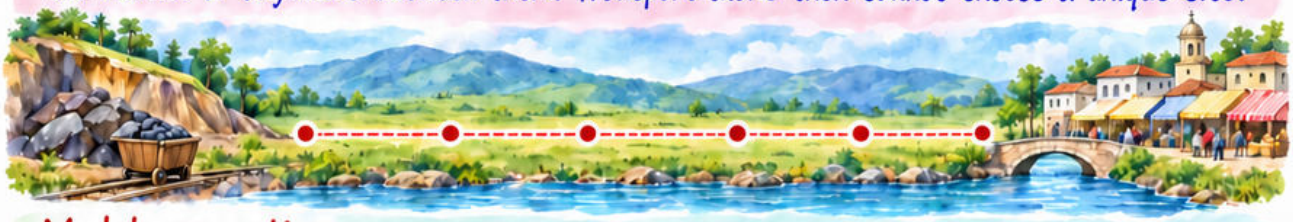


Material index

Material index equals the weight of localised materials divided by the weight of the product. Ubiquities are excluded from the numerator.

$$\text{Material index} = \frac{\text{weight of localised materials}}{\text{weight of the product}}$$

Above 1, weight loss pulls production towards the material deposit.
Below 1, production is pulled towards the market.
Exactly 1, with pure materials only, gives the same transport cost at the source, at the market or anywhere between them. Transport alone then cannot choose a unique site.



Model assumptions

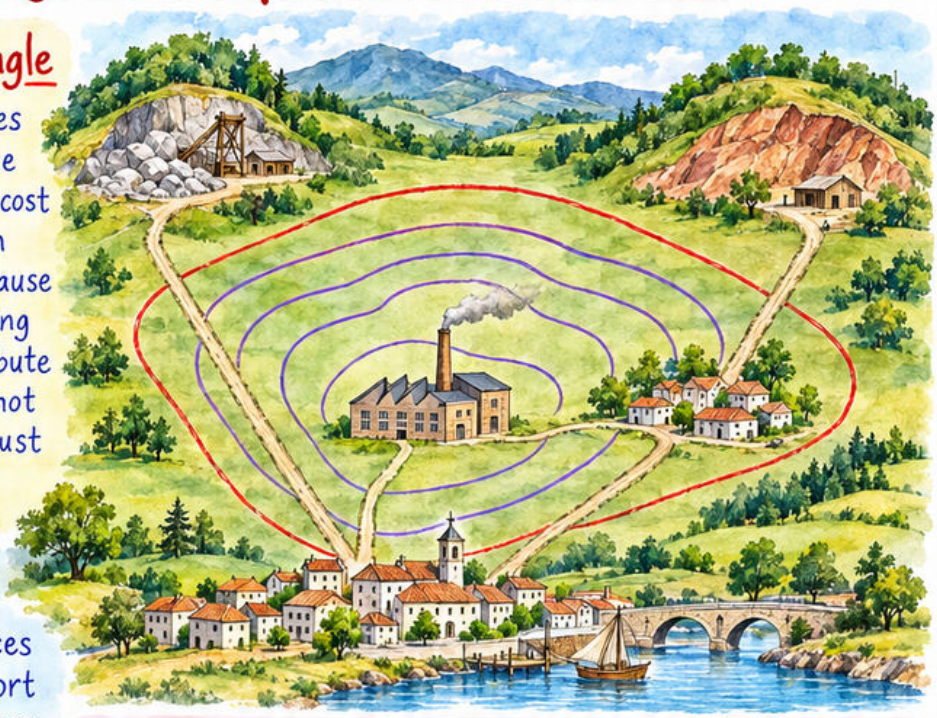
The model assumes an isolated region, transport costs varying only with distance, and perfect competition. Apply its conclusions within these assumptions rather than treating the formula as a complete description of every modern factory.

Sources: Day 30 Source Index | Topic 294

Triangle isodapanes and limits

The locational triangle

Two raw-material sources and one market form the three corners. The least-cost factory site is sought in relation to all three, because hauling inputs and moving the product both contribute to transport cost. Do not assume the best site must be one of the corners.



Isodapanes

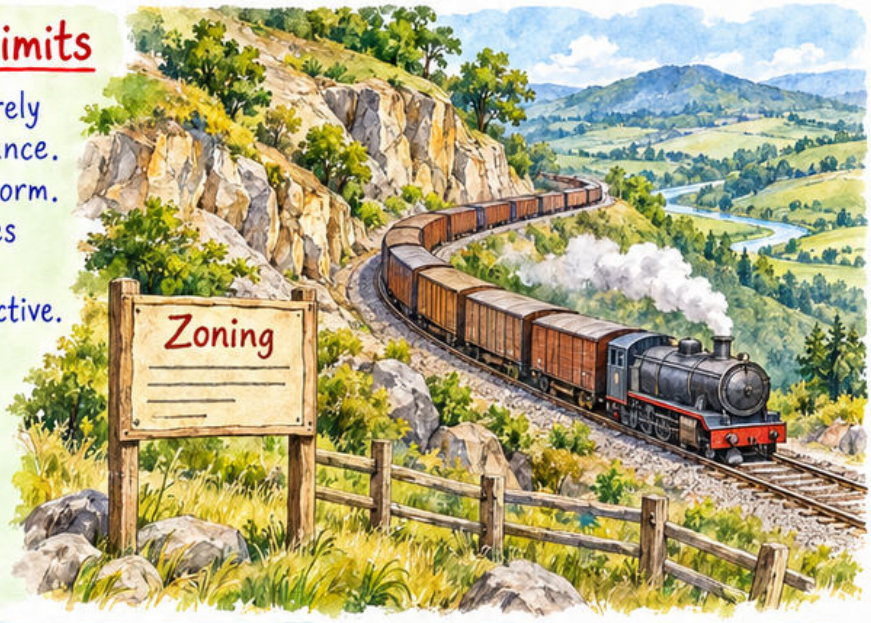
An isodapane joins places with equal total transport cost. The critical isodapane marks the point at which extra transport cost equals the saving on labour.

A cheaper-labour site can draw the plant away from the least-transport-cost site only when labour savings exceed the added transport cost. Agglomeration savings can also justify a move when they outweigh the extra transport bill. Equality marks the boundary; it is not automatically an additional net saving.

Why the model has limits

Actual freight rates are rarely exactly proportional to distance. The land surface is not uniform. Government zoning, subsidies and taxes influence which locations are possible or attractive.

Falling transport costs and global supply chains have weakened Weber's principles, although they remain useful for industries with a high material index.



Keep the terms distinct

The triangle describes the arrangement of two sources and one market. Isodapanes describe equal transport-cost locations. The critical isodapane compares the additional transport cost with labour savings; it does not describe equal wages or equal raw-material deposits.

Sources: Day 30 Source Index | Topic 294

Work out two material-index cases

Practice assumptions

These are made-up figures, not industrial statistics. The source and market are 100 km apart. Carrying one tonne for one kilometre costs the same for every good. Compare the two endpoint locations before considering labour or agglomeration savings.



Case A: a weight-losing material

Five tonnes of a localised material produce one tonne of finished product.

Material index = 5 divided by 1 = 5.

Factory at the source: carry one tonne of product for 100 km, giving 1 × 100 = 100 tonne-km.



Factory at the market: carry five tonnes of material for 100 km, giving 5 × 100 = 500 tonne-km.



The source is cheaper. A high material index means substantial weight is lost in processing, so transporting the lighter finished product saves cost.

Case B: add a ubiquity

One tonne of localised material plus two tonnes of water produces three tonnes of product.

Material index = 1 divided by 3 ≈ 0.33.

Factory at the source: 3 × 100 = 300 tonne-km.



Factory at the market: 1 × 100 = 100 tonne-km. The market is cheaper.



Water is a ubiquity in this model: it is obtained at the production site, excluded from the index numerator and need not be hauled. Labour or agglomeration can change either conclusion only if their savings exceed the extra transport cost.

Sources: Day 30 Source Index | Topic 294

Location factors change over time

Cotton textiles

Early mills concentrated in the cotton-growing belt of Maharashtra and Gujarat. Raw cotton, markets, transport including ports, labour and a moist climate all helped. Mumbai's first successful cotton mill began in 1854.



Today spinning is concentrated in Maharashtra, Gujarat and Tamil Nadu, while weaving is highly decentralised across handlooms, powerlooms and mills.



Cotton is a pure raw material that does not lose weight in manufacturing, so power, labour, capital and markets can decide location. NIOS and the older NCERT account describe the growing pull of markets. The current NCERT chapter calls markets the most important general factor but does not name an industry as specifically market-oriented; its aircraft and arms examples illustrate global markets.

Sugar shifts south and west

Mills tend to move towards southern and western states, especially Maharashtra. Cane has higher sucrose content, a cooler climate permits a longer crushing season, and cooperatives are more successful.



Changing and persistent pulls

Hydroelectricity and petroleum joined coal as important energy sources. Mechanisation reduced labour dependence, while cheaper transport weakened the pull of raw-material distance.

Some patterns persist: steel remains a raw-material-oriented industry, and the Chhotanagpur plateau has the greatest concentration of iron and steel industry. Location is therefore a changing balance of costs and advantages, not a fixed rule that applies identically across industries and decades.

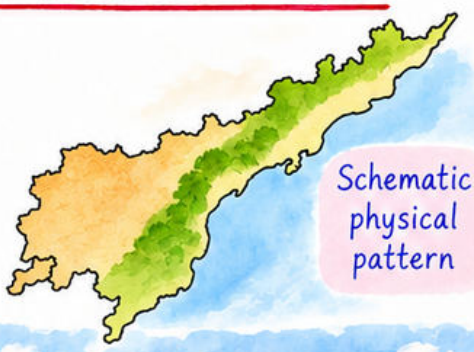


Sources: Day 30 Source Index | Topic 294

Three landforms across Andhra Pradesh

Read the land from east to west

Andhra Pradesh covers 1,62,970 sq km. Its three physical divisions are the Coastal Plains, the Eastern Ghats and the Deccan Plateau.



Schematic physical pattern

The coastal plains form the eastern strip between the Bay of Bengal and the Ghats, from the Odisha border in the north-east to Pulicat on the Tamil Nadu border. East-flowing rivers build fertile deltas; lakes, mangroves and the coastline belong to this division.



The Eastern Ghats are a broken belt of hills between coast and plateau, higher north of the Godavari. Their main rocks include charnockite, granite, khondalite and quartzite. The Nallamala consists mainly of quartzite of the Kadapa system.



The plateau occupies the western interior, west of the southern ranges, and forms part of the Deccan. It is commonly associated with Rayalaseema. Granite, sandy soil and scrub characterise the plateau description. Its major features include the Penna, Gandikota gorge, Belum caves and a dry interior climate.





Region is not landform

Coastal Andhra, Uttarandhra and Rayalaseema are regions made up of districts; physical divisions do not follow their boundaries. Tirupati district belongs to Rayalaseema but contains coastal Pulicat Lake and Sriharikota. Seshachalam and Nallamala also lie in Rayalaseema but belong to the Eastern Ghats. Never classify every feature in the region as plateau simply because it lies in Rayalaseema.



Tirupati district examples

Sources: Day 30 Source Index | Topic 295

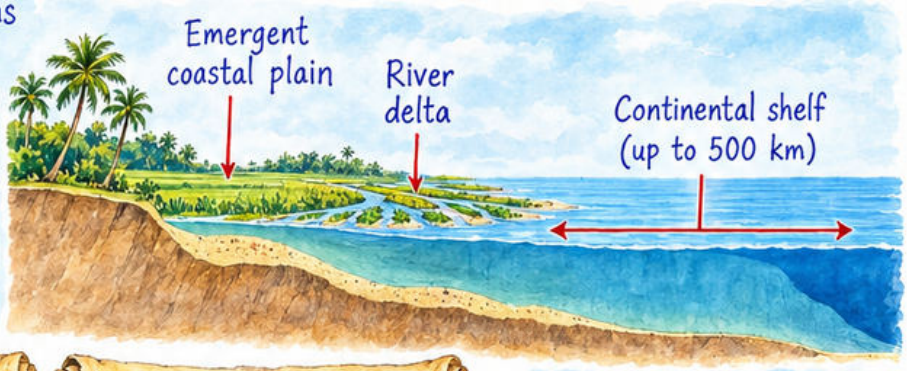
The coast and its revised length

A broad emergent coast

The eastern coastal plain is broader than the western one and is an emergent coast. East-flowing rivers form well-developed deltas before entering the Bay of Bengal. The Godavari and Krishna water fertile farming areas.



Its emergent nature means fewer ports and harbours. The continental shelf extends up to 500 km into the sea, making good ports and harbours difficult to develop. A wider shelf is not automatically an advantage for ports.



Old coastline figures

Andhra Pradesh had 973.7 km, commonly rounded to 974 km. It ranked second among states, behind Gujarat at 1,214.70 km and ahead of Tamil Nadu at 906.9 km.

Re-measured figures

Andhra Pradesh has 1,053.07 km, about 79 km more, but ranks third among states. Gujarat has 2,340.62 km and Tamil Nadu 1,068.69 km.



The National Hydrographic Office worked with the Survey of India on the re-measurement. A Ministry of Ports, Shipping and Waterways circular promulgated it on 29 April 2025; the Ministry of Earth Sciences reported it on 4 December 2025.

Keep the ranking universe

India's total coastline changed from 7,516.6 km to 11,098.81 km. Andaman and Nicobar Islands, a Union Territory, has more coastline than any state: 1,962 km earlier and 3,083.50 km re-measured. Do not insert this Union Territory into a ranking explicitly limited to states.

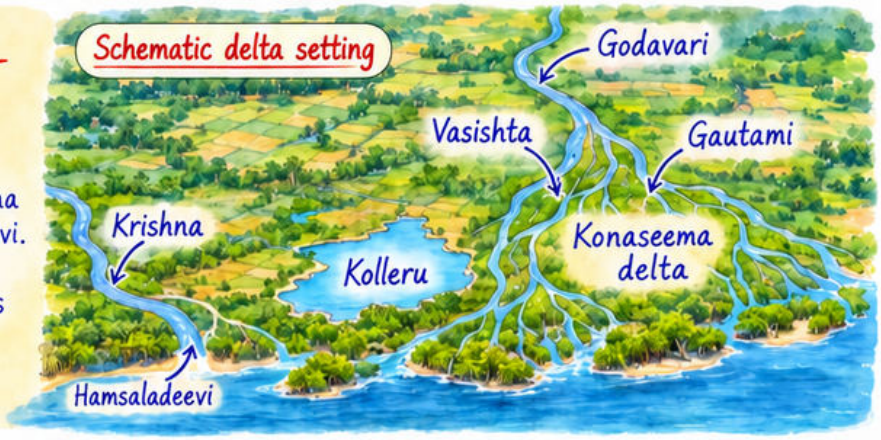


Sources: Day 30 Source Index | Topic 295

Deltas and two very different lakes

Deltas and estuaries

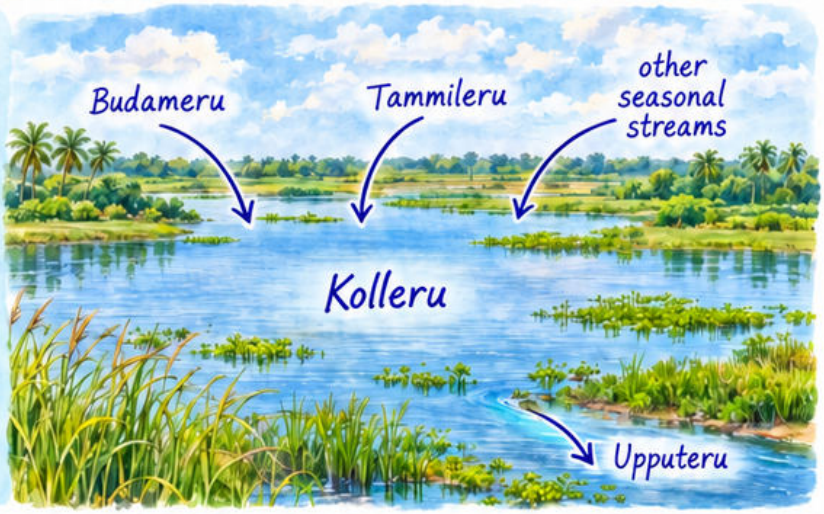
Below Dowleswaram, the Godavari divides into the Gautami and Vasishta; their delta is Konaseema. The Krishna reaches the sea at Hamsaladeevi. The Godavari and Krishna estuaries together hold India's second-largest mangrove ecosystem.



Kolleru: freshwater

Kolleru lies between the Krishna and Godavari deltas, mostly in Eluru district. Budameru, Tammileru and other seasonal streams feed it; Upputeru drains it.

It became a wildlife sanctuary in November 1999 under the Wild Life (Protection) Act, 1972. Ramsar designation followed on 19 August 2002, covering 90,100 hectares. It is Andhra Pradesh's only Ramsar site in the list dated 21 April 2026.



Pulicat: brackish lagoon

Pulicat is India's second-largest brackish-water lagoon after Chilika. Most lies in Tirupati district, Andhra Pradesh; the rest lies in Thiruvallur district, Tamil Nadu, Sriharikota is the barrier island separating the lagoon from the Bay of Bengal.

The Andhra Pradesh portion became a bird sanctuary in September 1976, covering 172 sq km. The Tamil Nadu portion became a sanctuary in October 1980. Pulicat is absent from the Ramsar list dated 21 April 2026.



Place and protection together

Both lakes and Sriharikota belong to the coastal plains. Kolleru is freshwater, a wildlife sanctuary and a Ramsar site. Pulicat is brackish, protected as a bird sanctuary and separated from the sea by a barrier island. Their water type, setting and protection dates are not interchangeable.



Sources: Day 30 Source Index | Topic 295

The broken Eastern Ghats and northern peaks

Broken and river-cut hills

The Eastern Ghats are discontinuous, low and heavily eroded by rivers including the Mahanadi, Godavari, Krishna and Kaveri. Important named ranges include the Javadi hills, Palkonda, Nallamala and Mahendragiri.



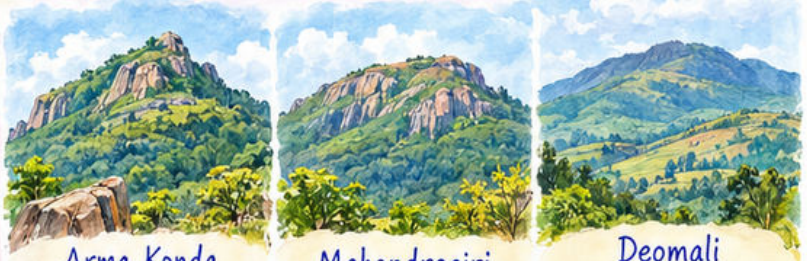
The Godavari crosses the Papi hills through a gorge. Low hills separate the Krishna and Godavari. North of the Godavari, hills rise sharply and form the Andhra Pradesh–Odisha boundary. The Vizag hills and Araku valley belong to this northern section; Araku lies near the Odisha boundary.



The highest-peak answer depends on the reference

The Zoological Survey of India gives Arma Konda in Andhra Pradesh as the Eastern Ghats' highest peak, at 1,680 m.

NCERT Class IX gives Mahendragiri at 1,501 m. Wikipedia identifies Deomali at 1,672 m as the highest peak of the northern section, which lies mostly in Odisha.



Arma Konda (1,680 m) in Andhra Pradesh

Mahendragiri (1,501 m)

Deomali (1,672 m) of the northern section, mostly in Odisha

These statements differ in reference and geographical scope. Do not replace one with another while claiming that every source agrees. When an examination explicitly follows NCERT, give Mahendragiri.

North and south are not identical

The high northern hills should not be confused with the lower river-cut stretches. Farther south, the hills form parallel ranges, with individual names and alignments that need to be located separately. A broken range can still contain high peaks; discontinuity does not mean the absence of elevated summits.



Sources: Day 30 Source Index | Topic 295

Locate the southern hill ranges

Parallel ranges southward

North of the Palar river, the southern Eastern Ghats form two north-south lines. In the Zoological Survey of India's description, the higher western line contains Palkonda, Lankamala and Nallamala; the lower eastern line contains Erramala and Velikonda. The Eramala grouping needs the separate caution on the next panel.

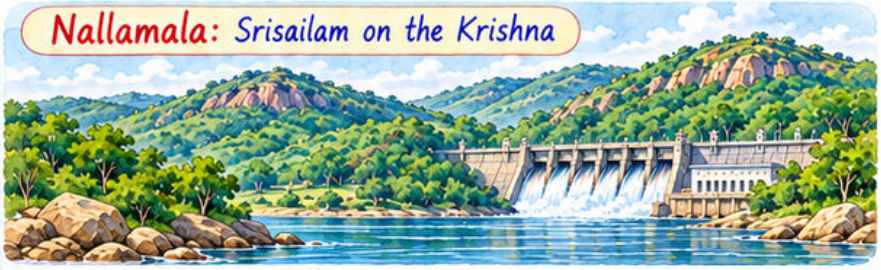


Nallamala

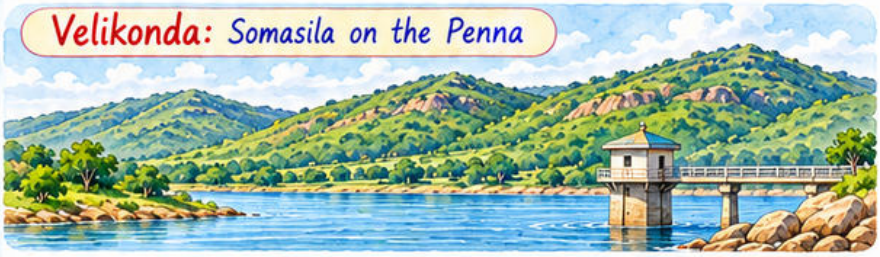
The Nallamala runs almost north-south between the Krishna and Penna, south of and continuing to the Krishna, along Rayalaseema's eastern edge. Its rocks are mainly quartzite of the Kadapa system, and its average height is about 520 m.

Srisailam, on the Krishna, is in the Nallamala and hosts a major hydroelectric project. Much of the forest belongs to Nagarjunsagar-Srisailam Tiger Reserve. Gundlakamma is the largest river rising in these hills.

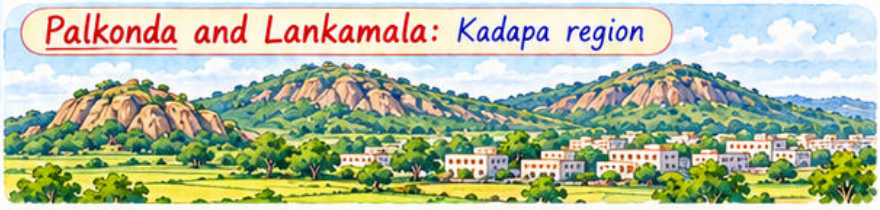
Nallamala: Srisailam on the Krishna



Velikonda: Somasila on the Penna

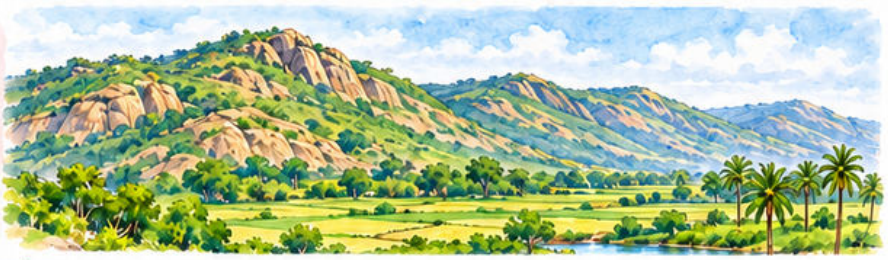


Palkonda and Lankamala: Kadapa region



Velikonda

The lower eastern range descends to the coastal plains in northern Nellore district. Somasila stands where the Penna leaves the range.



Palkonda and Lankamala

Palkonda lies in Kadapa district. Together with Nallamala, it surrounds Kadapa city, the district headquarters, on three sides.

Lankamala belongs to the higher western line with Palkonda and Nallamala. It is listed, together with Seshachalam, across Chittoor, Kadapa and Tirupati districts. Learn each range's named features rather than assuming every place in Kadapa belongs to the same hill range.



Sources: Day 30 Source Index | Topic 295

Seshachalam Erramala and grouping cautions

Seshachalam

The Seshachalam hills lie mostly in Tirupati district, within Rayalaseema. Tirumala, the pilgrimage town near Tirupati, stands on them. Seshachalam is Andhra Pradesh's one biosphere reserve, designated in 2010, and contains Sri Venkateswara National Park.



Erramala

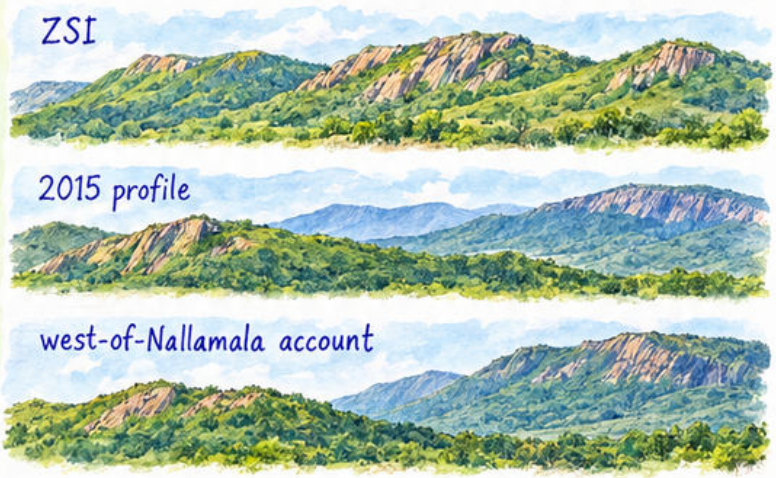
The Erramala lies on the eastern edge of the Deccan Plateau in western Andhra Pradesh. It trends north-east to south-west between the Krishna basin to the north and the Penna basin to the south.

It occurs in Kurnool and Nandyal districts and at Gandikota in Kadapa district. The higher Nallamala lies to its east. The Penna's Gandikota gorge cuts between Erramala cliffs and is classified with the plateau features.



Why ridge labels differ

ZSI groups Erramala with Velikonda in the lower eastern line of the Eastern Ghats. A Government of India profile from 2015 groups Erramala, Seshachalam and Palakonda on the inner ridge, and Nallamala and Velikonda on the outer ridge. Wikipedia places Erramala west of Nallamala; Britannica places it on the Deccan Plateau's eastern edge.



These classifications are not identical. Erramala therefore appears in discussions of both plateau and Eastern Ghats. Retain the named source when a question asks about a grouping. For general location, rely on its basin position, direction and named districts rather than memorising one ridge label as universally accepted.

Sources: Day 30 Source Index | Topic 295

The plateau gorge and limestone caves

The Deccan interior

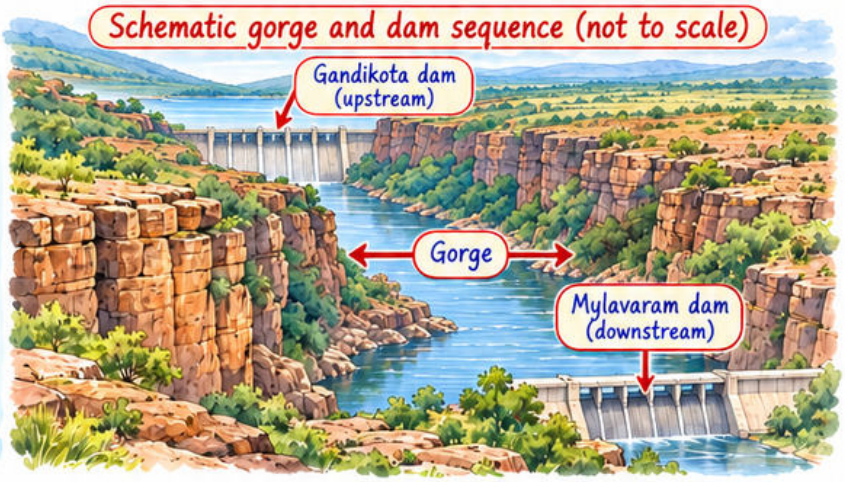
Andhra Pradesh's western plateau forms part of the Deccan and lies mainly in Rayalaseema, hence the familiar name Rayalaseema plateau. The Peninsular Plateau generally slopes from west to east; the Krishna and Penna cross the state eastwards towards the Bay of Bengal.

Parts of Anantapur, Sri Sathya Sai, Kurnool and Kadapa are semi-arid and lie in the Western Ghats' rain shadow.



Gandikota gorge

At Gandikota in Kadapa district, the Penna passes through a gorge about 200 m wide between cliffs of the Erramala, also called the Gandikota hills. Gandikota dam lies upstream of the gorge; Mylavaram dam lies downstream. The gorge belongs with the plateau features, even though Erramala also appears in some Eastern Ghats groupings.



Belum caves

Belum caves lie in Belum village, Kolimigundla mandal, Nandyal district. They extend about 3.23 km. They are a karst feature, formed as water dissolved limestone.

Layered sediments inside are interpreted as deposits of an old Chitravathi river course. Pataalaganga, the deepest point described by Incredible India, lies about 46 m below entrance level.



Remember the east-west sequence

Coastal lakes and deltas lie to the east, hill ranges occupy the middle, and the gorge and limestone caves illustrate the western interior plateau.



Sources: Day 30 Source Index | Topic 295

Read old district names and height records carefully

A historical district list

The 2014 Zoological Survey of India study lists 15 districts of the then undivided state. Twelve names fall within present Andhra Pradesh: Srikakulam, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Prakasam, Nellore, Kurnool, Cuddapah or Kadapa, Anantapur and Chittoor.

The other three, Khammam, Mahabubnagar and Nalgonda, are now in Telangana. These are the names and boundaries used in the older study, not a list of today's reorganised districts. Do not count them as the current administrative extent of Andhra Pradesh's hills.



Horsley Hills

Horsley Hills is a hill station near Madanapalle in southern Andhra Pradesh and belongs to the Eastern Ghats in the earlier comparison. General height figures there were about 1,265 to 1,290 m. ZSI records a collecting site on Horsley Hill at 1,236 m above sea level. A recorded collecting-site elevation need not be the summit height; keep the measurement and its scope together.



Connect places with landforms

The Godavari, Krishna, Penna and Vamsadhara link the interior to the coast. Earlier settlement comparisons place hill tribes in the Eastern Ghats and Nallamala, and the Yanadi in the plains. These associations help orient revision but do not replace individual locations: Tirumala belongs to Seshachalam, Srisailam to Nallamala, and Gandikota to the Penna gorge through Erramala.



Sources: Day 30 Source Index | Topic 295

Iron and steel industry

Basic industry

Iron and steel turns iron ore, coking coal and limestone into steel. It is a basic industry because all other industries depend on it for machinery.

Steel production and consumption are often regarded as an index of a country's development.





Heavy industry

Both raw materials and finished goods are heavy and bulky, making transport costly.

Cheap, bulky and weight-losing materials pull industries towards their source. Steel, sugar and cement are examples.

All steelmaking raw materials are described as weight-losing in the earlier Class XII geography text, so proximity to their sources is an important location advantage.



Ownership and revision

SAIL is a public-sector example; TISCO is a private-sector example. Recall Topic 294 on industrial location and ownership.

Study the raw materials, major plants, States, owners, collaborating countries and India's world position. The plant details use the earlier, pre-rationalised Class XII geography edition; basic classifications follow Class X.



Sources: Day 31 Source Index | Topic 306

Raw materials and location

The input ratio

Iron ore : coking coal : limestone are required in the approximate ratio 4 : 2 : 1.

Some manganese is also needed to harden steel. Dolomite and fire clay are additional raw materials; the earlier Class XII text gives no proportion for them.



The mineral belt

A crescent-shaped belt covering parts of Chhattisgarh, northern Odisha, Jharkhand and western West Bengal is rich in iron ore and coking coal.



Why Chhotanagpur leads

The Chhotanagpur plateau region has the maximum concentration of iron and steel industries. Four reasons: low-cost iron ore; high-grade raw materials nearby; cheap labour; and large growth potential in the home market.



Production and recall

India produced 282.4 million tonnes of iron ore in 2024, according to the World Steel Association.

Iron ore and manganese mining are covered in Topic 394.



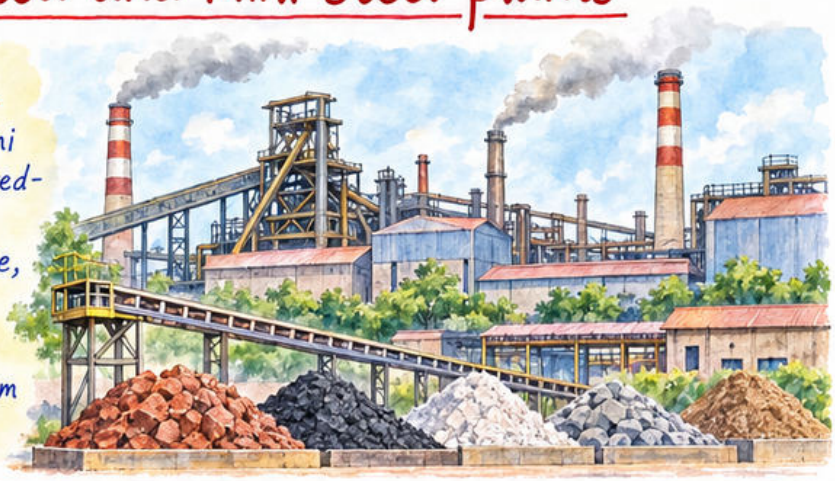
Sources: Day 31 Source Index | Topic 306

Integrated and mini steel plants

Large and small plants

Integrated plants are large; mini steel mills are smaller. Integrated-plant inputs include iron ore, coking coal, limestone, dolomite, manganese and fire clay.

Examples: Bhilai, Rourkela, Durgapur, Bokaro, Visakhapatnam and TISCO.



The earlier Class XII passage names mini mills without defining them or listing an example. It separately describes more than 206 units, mostly using scrap iron in electric furnaces. Do not treat that separate statement as its definition of mini mills. No furnace is named for integrated plants there.

Official categories

The Ministry of Steel uses "Major Integrated Steel Producers", or ISPs, and "secondary producers". The National Steel Policy, 2017 expects small MSME steel plants to be key drivers of new capacity.



Steelmaking routes

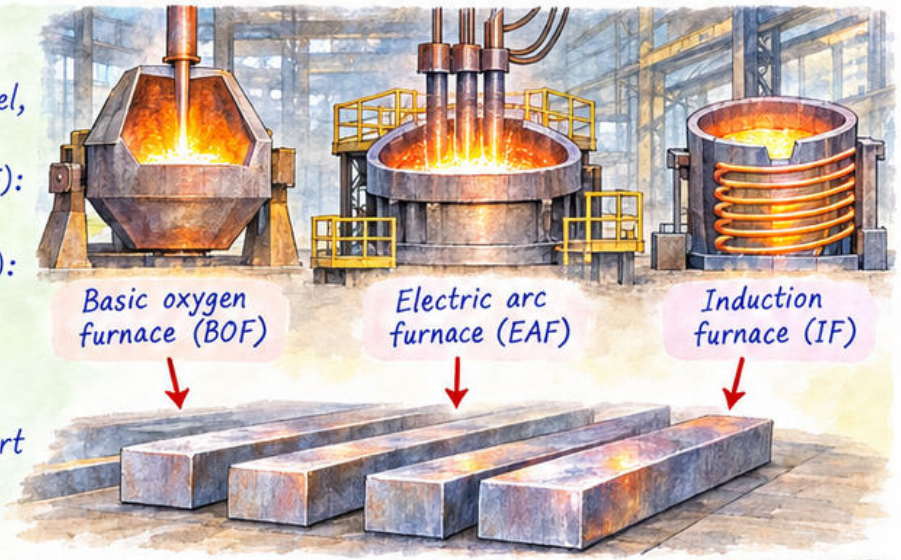
Share of Indian crude steel, 2020-21 → 2024-25:

Basic oxygen furnace (BOF): 43.5% → 41.1%.

Electric arc furnace (EAF): 28.4% → 20.8%.

Induction furnace (IF): 28.1% → 38.2%.

These are the Annual Report 2025-26 figures.



Sponge iron

India has been the world's largest sponge-iron producer every year since 2003. The coal-based route supplied 85% of its sponge iron in April-December 2025.



Sources: Day 31 Source Index | Topic 306

Early plants and major partners

TISCO and IISCO

TISCO: Jamshedpur, Jharkhand; Tata Steel, private sector. Company registered on 26 August 1907; first steel ingot rolled in February 1912. No collaborating country is named.

IISCO: Burnpur, West Bengal; SAIL. Burnpur unit established in 1937; no collaborating country is named.



Visvesvaraya

Visvesvaraya Iron and Steel Plant (VISL): Bhadravati, Karnataka; SAIL, special and alloy steel. Originally Mysore Iron and Steel Works. The NCERT entry gives no year or collaborating country.



The Second Plan trio

Bhilai, Chhattisgarh: SAIL; production from 1959; Russia, meaning the former USSR.

Rourkela, Odisha: SAIL; set up in 1959; Germany.

Durgapur, West Bengal: SAIL; production from 1962; United Kingdom.



The Second Five Year Plan, 1956–61, established these three public-sector plants under Hindustan Steel Limited. The Steel Authority of India Limited (SAIL) was formed in 1973 to manage them. Topic 285 names the partners as Soviet Union, West Germany and Britain respectively.



Sources: Day 31 Source Index | Topic 306

Later plants and SAIL units

Bokaro

Bokaro, Jharkhand: SAIL; set up in 1964. Collaboration was with Russia, the former USSR, using Soviet technology.





Visakhapatnam and Salem

Visakhapatnam, Andhra Pradesh: RINL; began operating in 1992. USSR assistance included Soviet credit for the first stage, recorded in the Lok Sabha answer of 28 November 1980.



Salem, Tamil Nadu: SAIL, special steel; commissioned in 1982. No collaborating country is named.



SAIL's plant groups

Integrated plants: Bhilai, Rourkela, Durgapur, Bokaro and Burnpur.

Special and alloy steel plants: Alloy Steels Plant at Durgapur, Salem and Bhadravati.



These are the plant groups in the Ministry of Steel Annual Report. Plant years and partner details follow the earlier Class XII geography edition, with Tata Steel dates and official ownership records used where appropriate.

Sources: Day 31 Source Index | Topic 306

Vijaynagar steel plant

Place

Vijaynagar is at Hosapete in Karnataka.



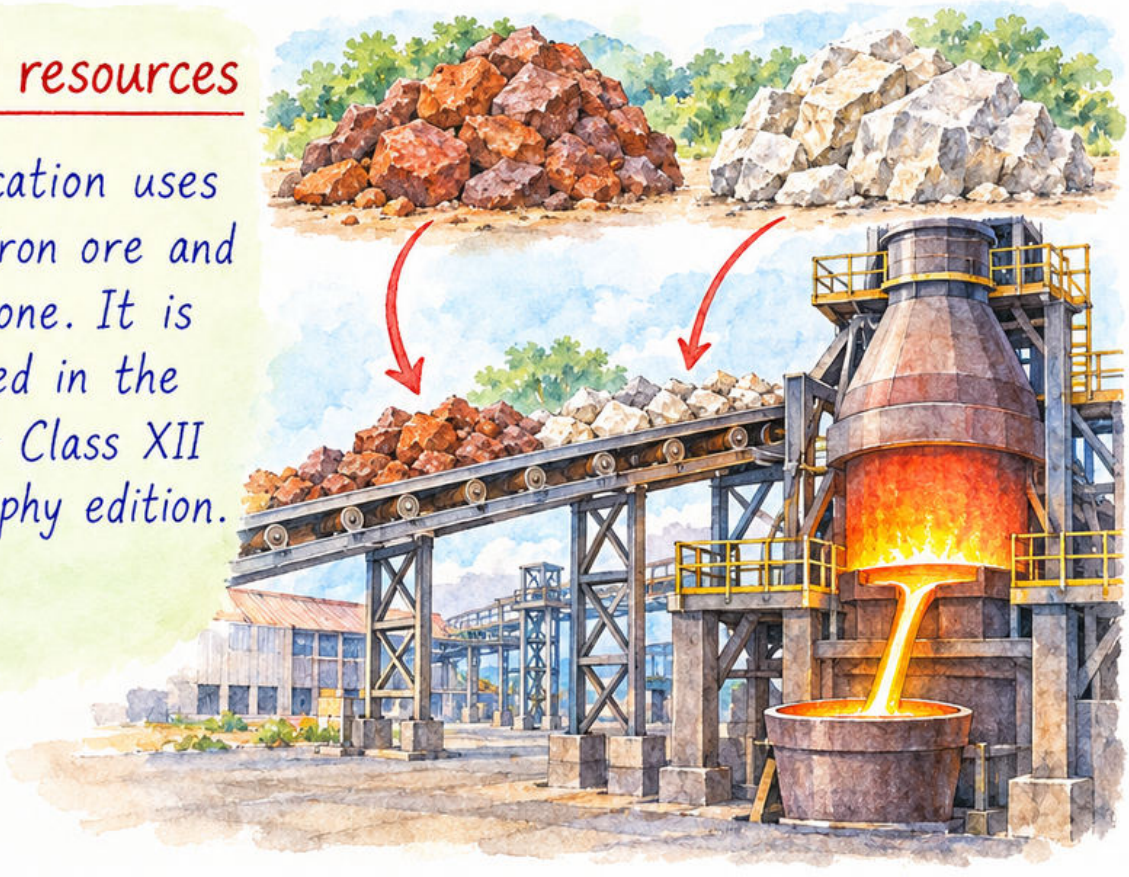
Technology

The plant was developed using indigenous technology.



Local resources

Its location uses local iron ore and limestone. It is included in the earlier Class XII geography edition.



Sources: Day 31 Source Index | Topic 306

India in world steel

Calendar-year production

India ranked second after China in crude steel in 2025. World Steel in Figures 2026 gives India 164.9 million tonnes, China 960.8 million tonnes and the world 1,848.9 million tonnes. The Ministry of Steel repeated these in July 2026.



Financial-year production and capacity

Crude steel production: 152.18 million tonnes in 2024–25; 170.15 million tonnes in 2025–26.

Crude steel capacity: 220.4 million tonnes in 2025–26. The Annual Report's earlier figure was 218.445 million tonnes up to December 2025.



Consumption totals

Finished steel consumption: 152.13 million tonnes in 2024–25; 164.36 million tonnes in 2025–26. These financial-year figures are from the Ministry's July 2026 release.



Per-person comparison

Ministry figure: India 115.7 kg in financial year 2025–26, against world consumption of 209 kg in calendar 2025.

World Steel Association: India 109.2 kg and world 209.0 kg in calendar 2025. Different periods and reporting bodies explain the two India figures; both are about half the world figure.



Sources: Day 31 Source Index | Topic 306

Steel trade and coking coal

Imported coking coal

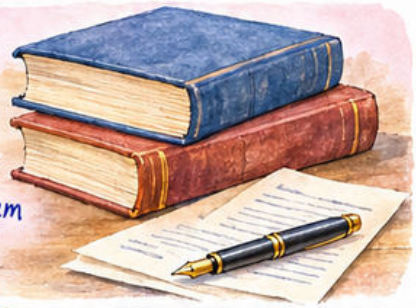
India imported 57.07 million tonnes of coking coal in 2024–25, according to the Ministry of Steel Annual Report 2025–26.

Most came from Australia; Russia supplied 7.746 million tonnes.



Different ministry figures

Topic 226 uses the Ministry of Coal figure of 57.58 million tonnes for 2024–25. The two ministries' totals differ slightly. Keep the figure with its source rather than silently treating them as identical.



Finished steel trade

India was a net importer of finished steel in 2023–24 and 2024–25, but a net exporter in 2025–26.

In 2025–26, exports were 6,601 thousand tonnes and imports 6,524 thousand tonnes. These trade figures are from the Ministry of Steel's March and July 2026 records.





Sources: Day 31 Source Index | Topic 306

Steel policy and green steel

National Steel Policy 2017

Targets for 2030–31:

Crude steel capacity: 300 million tonnes.

Crude steel production: 255 million tonnes.

Finished steel production: 230 million tonnes.

Sponge iron: 80 million tonnes; pig iron: 17 million tonnes.

Finished steel consumption: 158 kg per person.



Specialty steel PLI

The Union Cabinet approved the Production Linked Incentive scheme for specialty steel in July 2021. It was notified on 29 July 2021 with an outlay of Rs 6,322 crore. Recall Topic 293.

Its third round, PLI 1.2, opened on 4 November 2025.



Green Steel Taxonomy

The Ministry of Steel released the taxonomy on 12 December 2024 to support a more sustainable, low-carbon steel industry.

By 31 December 2025, 58 steel units had star-rated green steel certificates, covering 9.1 million tonnes of production.



Sources: Day 31 Source Index | Topic 306

Visakhapatnam Steel Plant

RINL and the port

Rashtriya Ispat Nigam Limited (RINL), a Navratna public-sector enterprise, is the plant's corporate entity and is wholly owned by the Government of India.

It is India's first shore-based integrated steel plant, with annual liquid-steel capacity of 7.3 million tonnes in the Annual Report 2025-26.

The earlier Class XII text calls it the first port-based plant and highlights its port advantage.



Financial stress

Net worth was minus Rs 4,538 crore on 31 March 2024. RINL defaulted on loan repayments in June 2024.



Revival package

On 17 January 2025, the Cabinet Committee on Economic Affairs, chaired by the Prime Minister, approved Rs 11,440 crore: Rs 10,300 crore equity plus conversion of Rs 1,140 crore working-capital loan into 7% non-cumulative preference shares, redeemable after 10 years.

The aim was full production using two blast furnaces from January 2025 and three from August 2025, The Rajya Sabha answer of 21 March 2025 states that this infusion involves no private-sector partnership.





Kadapa connection

The 2014 Reorganisation Act's Thirteenth Schedule lists an integrated steel plant in YSR District for SAIL to examine. Recall Topic 14; Kadapa is covered in Topic 334.



Sources: Day 31 Source Index | Topic 306

Steel industry challenges

Coking-coal dependence

Indian coking coal has very high ash content, prompting imports.

Imports rose from 51.20 million tonnes in 2020-21 to 57.07 million tonnes in 2024-25.





Mission Coking Coal

The Ministries of Steel and Coal plan to reduce the import bill by raising output from existing mines under Mission Coking Coal.

These figures and measures are in the Ministry of Steel Annual Report 2025-26.



Emissions and technology

Coal-based production accounted for 85% of Indian sponge iron in April-December 2025.

The Green Steel Taxonomy, released on 12 December 2024, certifies low-carbon steel with star ratings. Research priorities include low-emission steel, hydrogen-based production and carbon capture, or CCUS.



Sources: Day 31 Source Index | Topic 306

Raw materials and hydel power

Jamshedpur and Burnpur

TISCO uses iron ore from Noamundi and Badam Pahar, and coking coal from Jharia and West Bokaro. The old text also names Joda in Odisha; Tata Steel identifies Joda as an iron ore mine. Water comes from Subarnarekha and Kharkai. It is near the Mumbai–Kolkata railway, about 240 km from Kolkata port. Main pull: raw materials, helped by transport.



IISCO at Burnpur is near the Damodar valley coalfields, receives iron ore from Singhbhum and water from Barakar, and lies along the Kolkata–Asansol railway. Main pull: raw materials.



Bhadravati

VISL uses Kemangundi iron ore and local limestone and manganese, with no coal nearby, Jog Falls supplies hydropower; the Bhadra supplies water, called "Bhadravati river" in NCERT. Charcoal was used until 1951, followed by electric furnaces. It makes specialised steels and alloys. Main pull: hydel energy replacing coal.





Bhilai

Iron ore comes from Dalli-Rajhara; coal from Korba and Kargali; water from Tandula dam; power from Korba thermal station. The plant lies on the Kolkata–Mumbai railway. Main pulls: raw material and energy.



These location factors recall Topic 294; plant details follow the earlier Class XII edition.

Sources: Day 31 Source Index | Topic 306

Rourkela and Durgapur

Rourkela resources

Rourkela uses coal from Jharia and iron ore from Sundargarh and Kendujhar. Its location was chosen for proximity to raw materials.





Rourkela water and power

Power comes from Hirakud. Water comes from the Koel and Sankh rivers. Raw-material proximity is its main location factor.



Durgapur location

Durgapur lies in the Raniganj–Jharia coal belt and uses Noamundi iron ore. The Damodar Valley Corporation, DVC, supplies hydel power and water. It lies on the Kolkata–Delhi railway route.

Its main location factors are raw materials and transport.

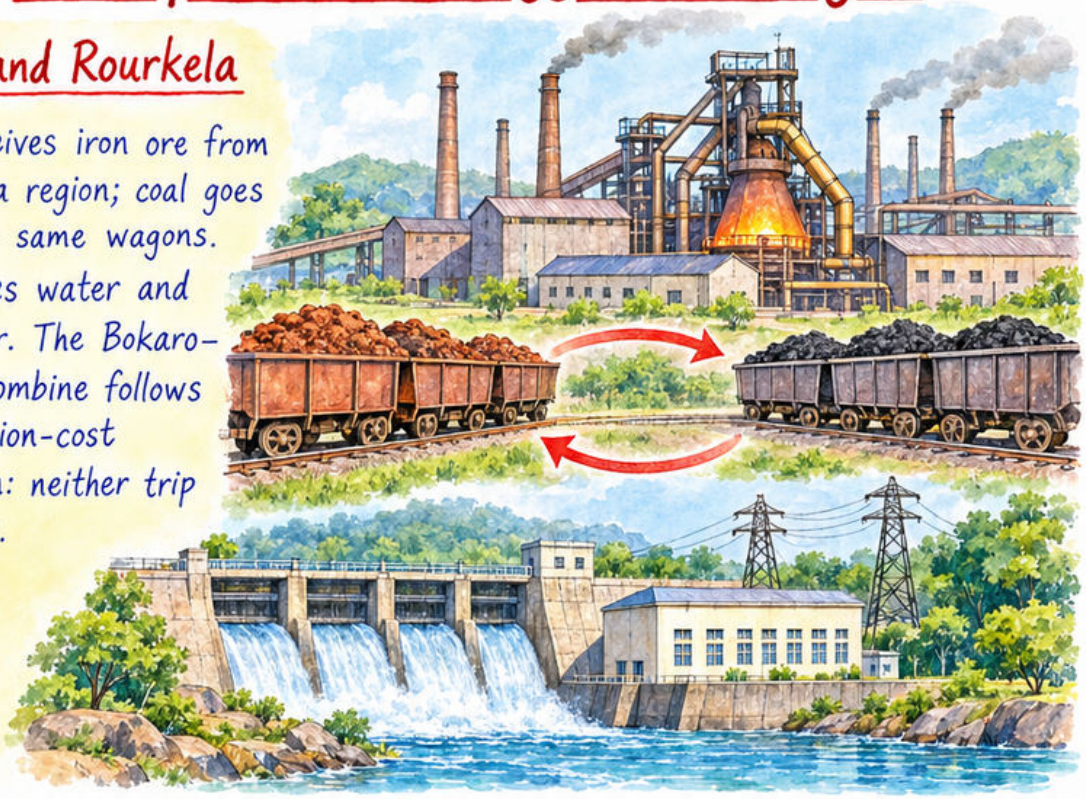


Sources: Day 31 Source Index | Topic 306

Transport and energy advantages

Bokaro and Rourkela

Bokaro receives iron ore from the Rourkela region; coal goes back in the same wagons. DVC supplies water and hydel power. The Bokaro–Rourkela combine follows transportation-cost minimisation: neither trip runs empty.



Visakhapatnam

India's first port-based plant benefits from its port location. The source passage does not describe its raw materials or water and power. Its main pull is the port, a transport advantage.



What the locations show

Most plants stand on or near the Chhotanagpur region's coal and iron ore. Weight-losing raw materials pull the industry towards their source, as in Topic 294.

VISL illustrates energy deciding location: without nearby coal, Jog Falls hydel power ran its electric furnaces. Visakhapatnam illustrates the newer pull of a port.



Sources: Day 31 Source Index | Topic 306

Steel industry exam traps

Chhotanagpur is not just coal

Its maximum concentration of iron and steel industries rests on four reasons: cheap iron ore, nearby high-grade raw materials, cheap labour and strong growth potential in the home market.



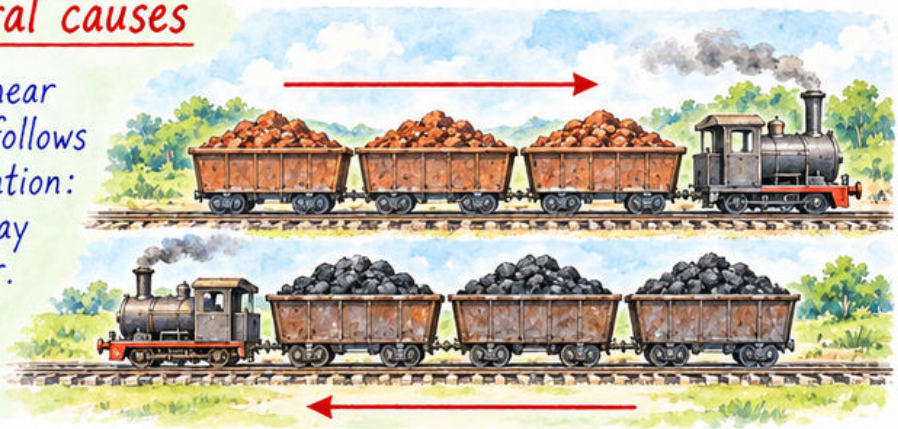
TISCO is private

TISCO, now Tata Steel, is a private company. SAIL is public sector. The Second Plan plants first came under Hindustan Steel Limited and later SAIL.

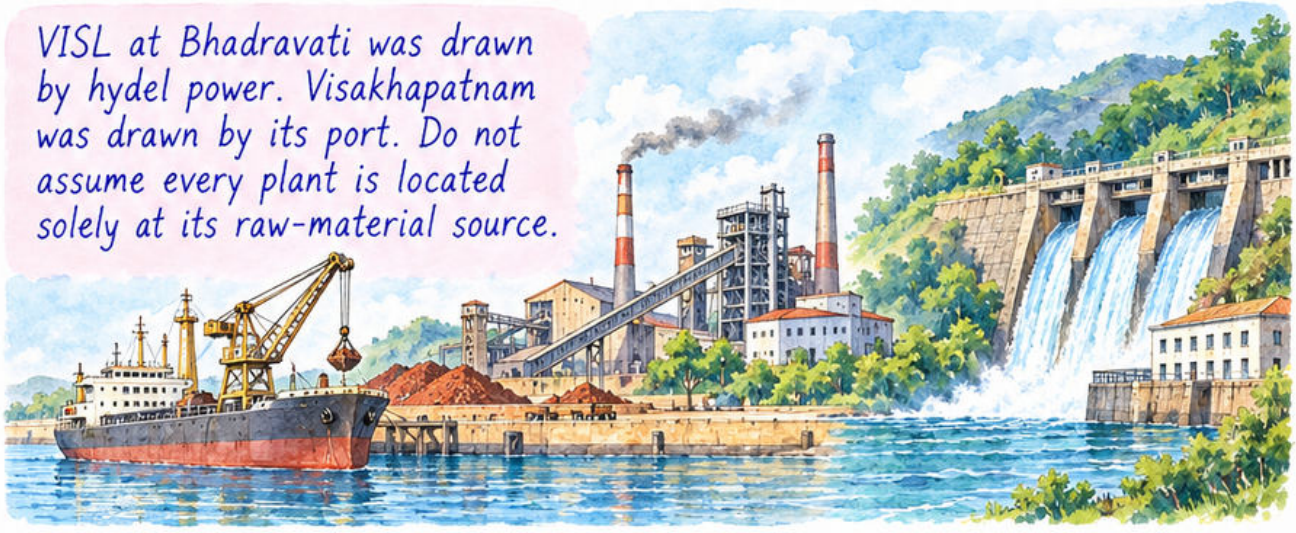


Location has several causes

Rourkela was located near raw materials. Bokaro follows transport-cost minimisation: wagons take ore one way and coal back the other.



VISL at Bhadravati was drawn by hydel power. Visakhapatnam was drawn by its port. Do not assume every plant is located solely at its raw-material source.



Sources: Day 31 Source Index | Topic 306

Concept in one line

A major port is a port that the Union declares to be one by law and runs through a Major Port Authority (Kamarajar Port is run as a company).
As at 7 November 2026: 14 major ports, of which 12 are operational.





Major port

A major port is a port that the Union declares to be one by law and runs through a Major Port Authority.

Kamarajar Port

Kamarajar Port is run as a company.



As at 7 November 2026

14 major ports



12 are operational



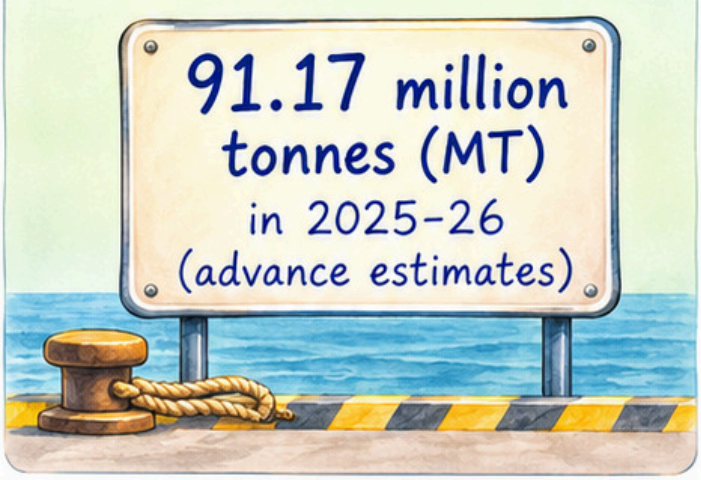
Andhra Pradesh: Visakhapatnam

Visakhapatnam is the State's only major port; it handled 91.17 million tonnes (MT) in 2025-26 (advance estimates), fourth among the major ports, and every other port of the State is a non-major port under the Andhra Pradesh Maritime Board.

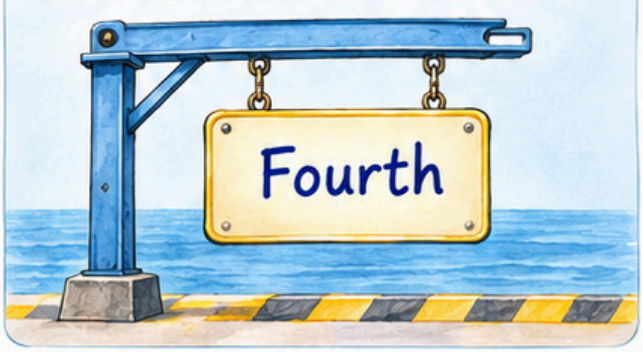
Major port



Cargo handled



Rank among major ports



Other ports

Every other port of the State is a non-major port under the Andhra Pradesh Maritime Board.



Major ports (India)



Operational major ports



2.1 Major and non-major ports: the Constitution and the law

Point	Major port	Non-major port
Entry in the Seventh Schedule	Union List, Entry 27: "Ports declared by or under law made by Parliament or existing law to be major ports, including their delimitation, and the constitution and powers of port authorities therein." 	Concurrent List, Entry 31: "Ports other than those declared by or under law made by Parliament or existing law to be major ports." 
Who controls it	The Union, through the Ministry of Ports, Shipping and Waterways 	The State Maritime Board or the State Government 
Law for its management	The Major Port Authorities Act, 2021 	The Indian Ports Act, 2025, in force from 1 April 2026 
Number (as at 7 November 2026)	14, of which 12 are operational 	About 200, of which around 65 handle cargo 

2.1 Major and non-major ports: the Constitution and the law

Non-major ports fall under Concurrent List Entry 31, not the State List. State Governments or State Maritime Boards administer them.



Non-major ports are also called minor ports. Most of the 200 that do not handle cargo are "Port Limits" used mainly by fishing vessels and small ferries.



14 major ports



12 operational



2.2 The Major Port Authorities Act, 2021

The Act provides for the regulation, operation and planning of major ports. It came into force on 3 November 2021, and the Major Port Trusts Act, 1963 stands repealed.



Each major port is now run by a Major Port Authority. Its administration, control and management are vested in the Board of that Authority.



The Board, in a line (section 3(1) of the Act):

- a chairperson
- a deputy chairperson
- one member each from the State Government
- the Ministry of Railways
- the Ministry of Defence
- Customs
- two to four independent members
- one ex officio member nominated by the Centre
- two members representing the employees

The Centre appoints the chairperson and the deputy chairperson on the recommendation of a selection committee.

The Board, or its committees, fixes the rates of the port, a task done earlier by the Tariff Authority for Major Ports.



An Adjudicatory Board set up by the Centre takes the place of that Tariff Authority.



Parliament passed the Bill in two steps: the Lok Sabha on 23 September 2020 and the Rajya Sabha on 10 February 2021.



2.3 Kamarajar: the major port run as a company

The 12 operational major ports comprise 11 Port Authorities and one company, Kamarajar Port Limited.



The port was incorporated as Ennore Port Limited under the Companies Act, 1956 in October 1999. It was commissioned on 1 February 2001, and commercial work began on 22 June 2001 with the unloading of thermal coal.



It was planned mainly to handle thermal coal for power stations in Tamil Nadu.



Kamarajar is India's first corporatized major port and a company of Chennai Port Authority.



It is an artificial harbour protected by two breakwaters.



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2.4 Four renamed major ports

Old name	New name	Date	Milestone
Tuticorin Port Trust 	V.O. Chidambaranar Port Trust	27 January 2011	The Union Cabinet approved the renaming; the change of name took effect on 11 February 2011.
Ennore Port Limited 	Kamarajar Port Limited	25 February 2014	The Registrar of Companies, Chennai issued a fresh certificate of incorporation in the new name.
Kandla Port Trust 	Deendayal Port Trust	25 September 2017	A notification under the Indian Ports Act, 1908 replaced "Kandla" with "Deendayal".
Kolkata Port 	Syama Prasad Mookerjee Port, Kolkata	24 June 2020	Gazette notification S.O. 2020(E), after the Cabinet's approval announced on 3 June 2020.

2.4 Four renamed major ports

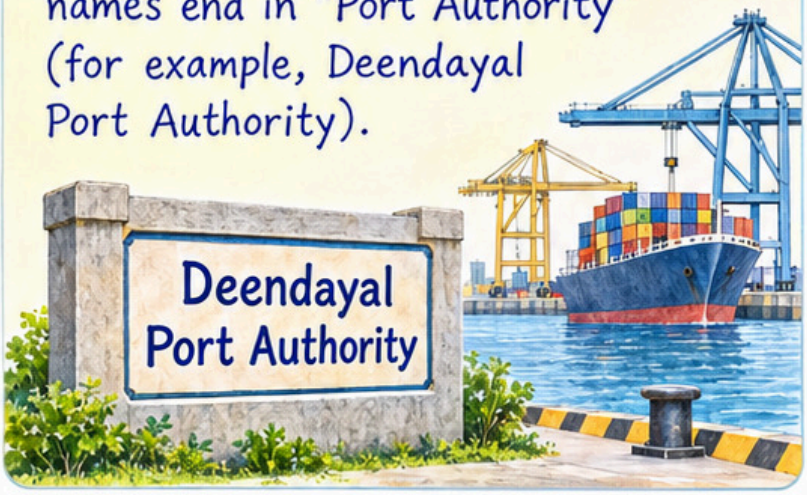
V.O. Chidambaranar Pillai (1872 to 1936) was from Ottapidaram, near Tuticorin. He founded the Swadeshi Steam Navigation Company, and in 1906 he started India's first indigenous shipping service, between Tuticorin and Colombo.



The Kandla notification marked the close of the centenary celebrations of Pandit Deendayal Upadhyay.



Under the 2021 Act the Port Trusts became Port Authorities, so today's names end in "Port Authority" (for example, Deendayal Port Authority).



14 major ports



12 operational



2.5 The major ports, from west to east



Port	State	Coast	Former name	Key feature
Deendayal	Gujarat	West	Kandla	On the Gulf of Kutch; first in cargo in 2025-26
Mumbai	Maharashtra	West	None	Fifth in cargo in 2025-26
Jawaharlal Nehru	Maharashtra	West	None	Third in cargo in 2025-26; with the Maharashtra Maritime Board it proposed the Vadhavan port (proposal in 2019)
Mormugao	Goa	West	None	The highest growth of cargo in 2025-26 (14.96 per cent), but the smallest cargo of the 12
New Mangalore	Karnataka	West	None	50.05 MT in 2025-26
Cochin	Kerala	West	None	The lowest growth of cargo in 2025-26 (0.84 per cent),
V.O. Chidambaranar	Tamil Nadu	East (Gulf of Mannar)	Tuticorin	Named after V.O. Chidambaranar Pillai
Chennai	Tamil Nadu	East	None	Kamarajar Port Limited is "A Company of Chennai Port Authority"



2.5 The major ports, from west to east

Port	State	Coast	Former name	Key feature
Kamarajar	Tamil Nadu	East	Ennore	Incorporated as a company in October 1999
Visakhapatnam	Andhra Pradesh	East	None	Inner harbour built by the Bengal Nagpur Railway between 1927 and 1933
Paradip	Odisha	East	None	Second in cargo in 2025-26
Syama Prasad Mookerjee	West Bengal	East	Kolkata	India's first major port and its only riverine major port; it came under a Trust on 17 October 1870



- Syama Prasad Mookerjee Port comprises two dock systems, the Kolkata Dock System and the Haldia Dock Complex, counted together as one major port.

- "None" denotes no former name specified in this table.

- Tamil Nadu has three major ports and Maharashtra two. Every other State in the table has one. The west coast has six operational major ports and the east coast six.



2.5 The major ports, from west to east

The two major ports that are not yet operational.

Two ports outside the 12 have been notified as major ports and are not yet working:

- **Galathea Bay**, an international transshipment port planned in Great Nicobar Island (Andaman and Nicobar Islands).
- Notified as a major port; not yet operational.



- **Vadhavan**, near Dahanu in Palghar district, Maharashtra.
- A Gazette notification of 19 February 2020 (S.O. 758(E)), issued under the Indian Ports Act, 1908, declared Vadhavan Port a major port "with immediate effect".
- The Union Cabinet approved the project on 19 June 2024 at an estimated cost of Rs 76,220 crore, and the Prime Minister laid its foundation stone on 30 August 2024.
- Phase I is expected by 2030 (target stated in August 2025).



2.6 Cargo and rank, 2025-26

2025-26 figures: advance estimates. 2024-25 figures: provisional.



Rank	Port	Cargo in 2025-26 (MT)	Share of major-port cargo (per cent)	Growth over 2024-25 (per cent)
1	Deendayal	160.11	17.50	6.63
2	Paradip	156.45	17.10	4.02
3	Jawaharlal Nehru	102.01	11.15	10.74
4	Visakhapatnam	91.17	9.97	10.34
5	Mumbai	75.15	8.22	9.50
12	Mormugao	20.84	2.28	14.96
Total	All 12 major ports	914.73	100.00	7.00

- In 2024-25 the 12 handled 854.86 MT (provisional).
- Of the 2025-26 total, overseas cargo was 76.67 per cent and coastal cargo 23.33 per cent.

Key takeaway

- Deendayal and Paradip are close at the top. Rankings refer to 2025-26 advance estimates.



2.7 Policy in brief

- Sagarmala:

the Union Cabinet approved the concept on 25 March 2015. It aims to promote port-led development, through five components: coastal shipping and inland water transport, port modernisation, port connectivity, port-led industrialisation and coastal community development.



- Maritime India Vision 2030:

a roadmap launched in 2021, with over 150 initiatives and a projected investment of Rs 3 to 3.5 lakh crore across ports, shipping and inland waterways.



- Maritime Amrit Kaal Vision 2047:

released by the Prime Minister in 2023, with more than 300 initiatives and an investment of nearly Rs 80 lakh crore.



Chronology of the major-port system





Date	Event
17 October 1870	The port at Kolkata comes under a Trust
1927 to 1933	The inner harbour at Visakhapatnam is built
1963	The Major Port Trusts Act is passed
October 1999	Ennore Port Limited is incorporated under the Companies Act, 1956
22 June 2001	Commercial work begins at Ennore with thermal coal
27 January 2011	The Cabinet approves renaming Tuticorin Port Trust as V.O. Chidambaranar Port Trust
25 February 2014	Ennore Port Limited becomes Kamarajar Port Limited
25 March 2015	The Cabinet approves the Sagarmala concept
25 September 2017	Kandla Port Trust becomes Deendayal Port Trust
19 February 2020	A Gazette notification declares Vadhavan Port a major port
24 June 2020	Gazette notification renames Kolkata Port as Syama Prasad Mookerjee Port, Kolkata
2021	Maritime India Vision 2030 is launched
10 February 2021	The Rajya Sabha passes the Major Port Authorities Bill



chronology of the major-port system

Date	Event
3 November 2021	The Major Port Authorities Act, 2021 comes into force; the 1963 Act stands repealed
2023	Maritime Amrit Kaal Vision 2047 is released
19 June 2024	The Union Cabinet approves the Vadhavan port project
30 August 2024	Foundation stone of Vadhavan port
2025-26	The 12 operational major ports handle 914.73 MT (advance estimates)
7 November 2026	14 major ports; 12 operational



Three common exam traps

1. "India has 12 major ports" or "India has 13".

As at 7 November 2026 there are 14 major ports, of which 12 are operational. The cargo table counts only the 12 that work. Galathea Bay and Vadhavan have both been notified as major ports, but neither is operating yet. Do not confuse these counts with the roughly 200 non-major ports, of which about 65 handle cargo.



2. "The biggest major port is Mumbai."

FALSE.

By cargo in 2025-26 (advance estimates), Deendayal came first. Mumbai was only fifth, behind Visakhapatnam. Rankings depend on the year and cargo basis; advance estimates may be revised.



3. Mixing up the two visions.

Maritime India Vision 2030 came first, in 2021, with over 150 initiatives. Maritime Amrit Kaal Vision 2047 followed in 2023, with more than 300 initiatives. Sagarmala is older than both (2015) and is a pillar of both.



Rural and urban population

The Census of India counts a place as urban if it is a statutory town or a census town and treats every other place as rural, and by the provisional figures of 2011 about 31 per cent of India's people lived in urban areas.

Urban and rural : schematic view



Urban area



Rural area

Urban: statutory towns and census towns.

Rural: all other places.

In provisional Census2011 figures, about31% of India's population lived in urban areas.

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Census figures: year and geographical base

India, Census 2011: final population 1,210,854,977; provisional population 1,210,193,422. Provisional urban share: 31.16%.

Final population	1,210,854,977
Provisional population	1,210,193,422
Provisional urban share	31.16%

A 2011 population figure belongs to the geographical boundaries used for that figure.

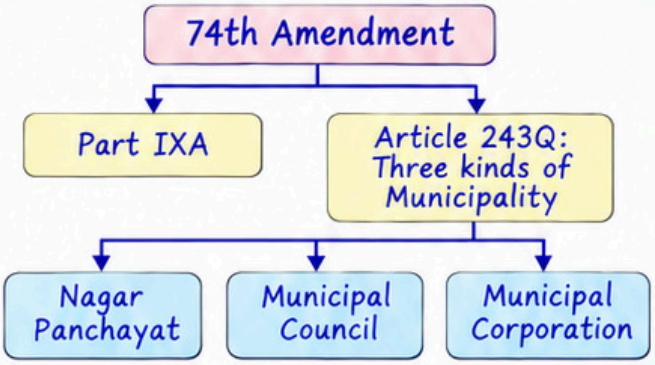
Census concepts

- Statutory town
- Census town
- Outgrowth
- Urban agglomeration
- City

Urban agglomeration (example)



The 74th Amendment added Part IXA. Article 243Q provides for three kinds of Municipality.



Andhra Pradesh, Census 2011 final: undivided State 84,580,777; recast present State 4,95,77,103.

Andhra Pradesh, Census 2011

Undivided State	84,580,777
Present State (recast)	4,95,77,103

These are different geographical bases.



2.2 Urban and rural: the Census definitions (1/4)

The Census uses two units: "the unit of classification in this regard is 'town' for urban areas and 'village' for rural areas."

Census units:

- Two units: 'town' and 'village".
- 'Town' is the unit for urban areas.
- 'Village' is the unit for rural areas.

Meaning of the units (Census):

Town (urban area)



Unit for urban areas

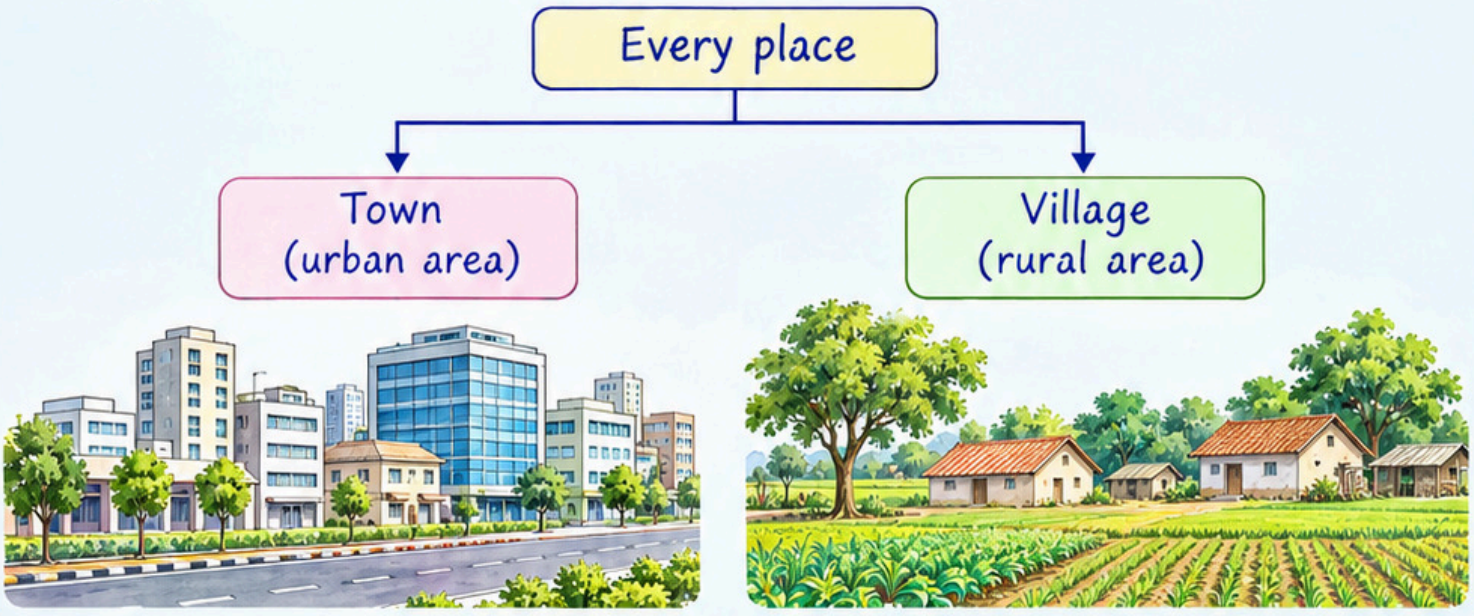
Village (rural area)



Unit for rural areas

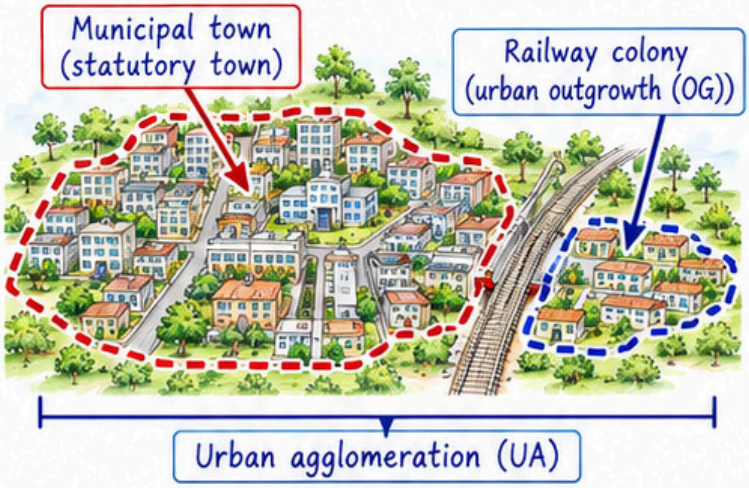
Classification of places (Census):

Every place is one or the other.



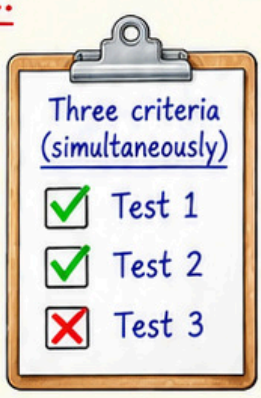
Term	Census definition	Example (illustration)
Urban area	Two kinds: statutory towns, and other places that pass three tests (census towns)	**Both kinds below** Urban area → Statutory town → Census town
Statutory town	A place with a municipality, corporation, cantonment board or notified town area committee. It is notified under law by the State or Union territory government and is urban whatever its population	A small cantonment governed by a cantonment board is urban even with fewer than 5,000 people 
Census town	A place without such a body that has all three: (a) a population of at least 5,000; (b) at least 75 per cent of the male main working population in non-agricultural pursuits; (c) a density of at least 400 persons per sq km	A large village with a gram panchayat, 6,000 people, 450 persons per sq km and 80 per cent of its male main workers outside farming 
Outgrowth (OG)	An urban spread near a city or statutory town, outside its statutory limits but within the revenue limits of a contiguous village	"railway colonies, university campuses, port areas, etc." 

2.2 Urban and rural: the Census definitions (3/4)

Term	Census definition	Example (illustration)
Urban agglomeration (UA)	"a continuous urban spread constituting a town and its adjoining urban outgrowths (OGs) or two or more physically contiguous towns together and any adjoining urban outgrowths of such towns." For 2011 it must contain at least one statutory town and at least 20,000 people as per the previous Census	A municipal town together with the railway colony just outside its limits 
Rural area	Every place that is not a town; its unit is the village	A village with a gram panchayat that fails even one of the three tests 

The three tests are joint.

The Census's words are "satisfying the following three criteria simultaneously". A place that passes two tests and fails the third stays rural.



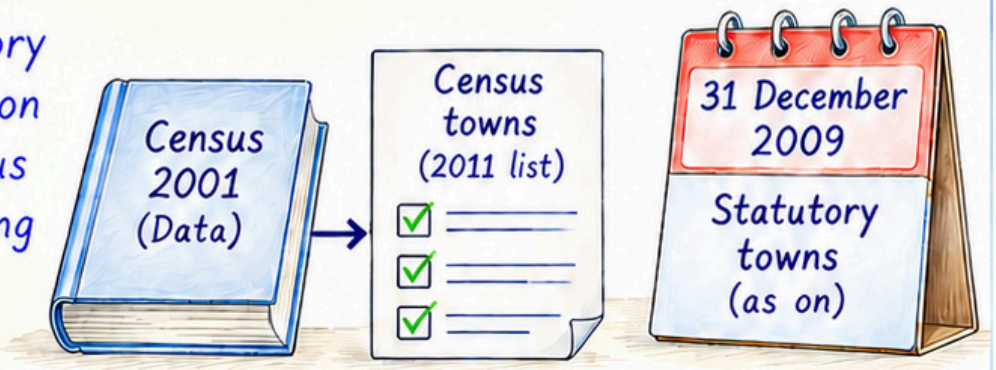
"Male main working population".

The 2011 test counts the male main working population. The Census's 2001 wording said only "male working population". Women workers are not counted in this test.



2.2 Urban and rural: the Census definitions

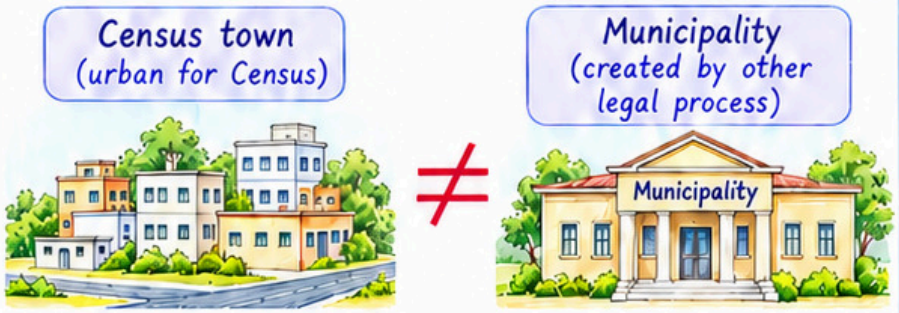
For Census 2011, statutory towns were identified as on 31 December 2009. Census towns were identified using Census 2001 data.



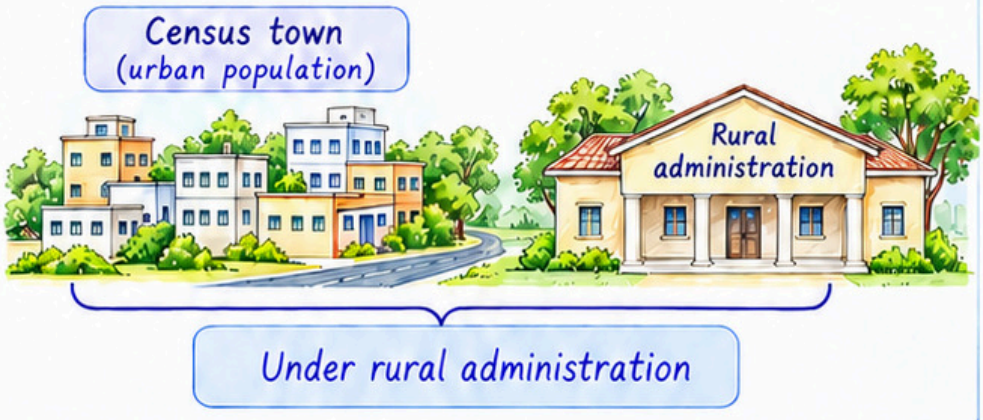
A selected census town was not declassified when the new Census data showed that it no longer met the criteria. → Retains census-town status

Census status and municipal status are different.

Under Article 243Q, the Governor specifies transitional, smaller and larger urban areas.



Classifying a place as a census town does not itself create a municipality. Census towns may remain under rural administration.

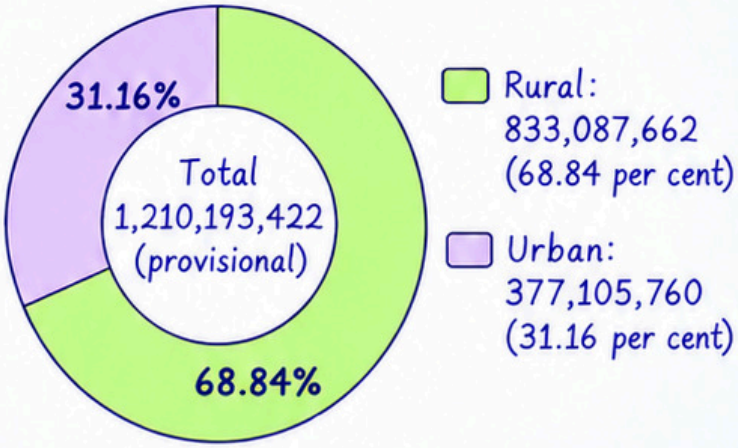


2.3 India in 2011: rural and urban

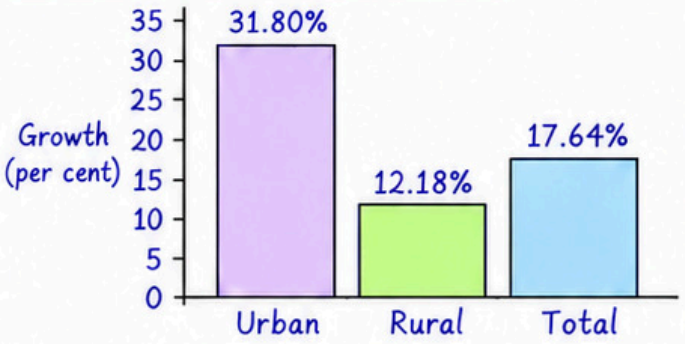
These Census 2011 figures are provisional: they add up to the provisional total of 1,210,193,422, not the final 1,210,854,977.

- **Rural population:** 833,087,662 (68.84 per cent).

- **Urban population:** 377,105,760 (31.16 per cent, up from 27.81 per cent in 2001).



Decadal growth, 2001–11:



The final total growth is 17.7 per cent; do not mix the two.

- **Towns:** 7,935 (provisional) in 2011 against 5,161 in 2001: 4,041 statutory towns and 3,894 census towns.



- In 2001 India had 286.11 million urban people in 5,161 towns.



So in 2011 roughly two out of three Indians still lived in rural areas, but the urban population was growing well over twice as fast.



2.4 India and Andhra Pradesh compared

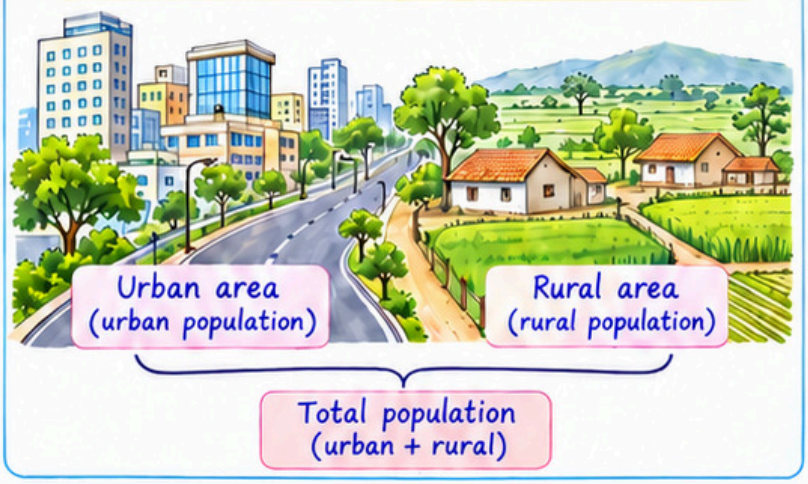
India and Andhra Pradesh compared on two geographical bases: undivided Andhra Pradesh and the present State recast to 2011 boundaries.

Keep final and provisional totals separate. Distinguish the undivided State from the present State.

Measure	India	Andhra Pradesh	Year	Base
Urban share	31.16 per cent	33.49 per cent	2011	Provisional; undivided State
Urban share	31.16 per cent	29.47 per cent	2011	AP recast for the present State
Urban share	27.81 per cent	27.30 per cent	2001	Undivided State
Urban share	27.81 per cent	24.13 per cent	2001	AP recast for the present State
Rural population	833,087,662	56,311,788	2011	Provisional; undivided State
Urban population	377,105,760	28,353,745	2011	Provisional; undivided State
Rural decadal growth	12.18 per cent	1.64 per cent	2001-11	Provisional; undivided State
Urban decadal growth	31.80 per cent	36.26 per cent	2001-11	Provisional; undivided State

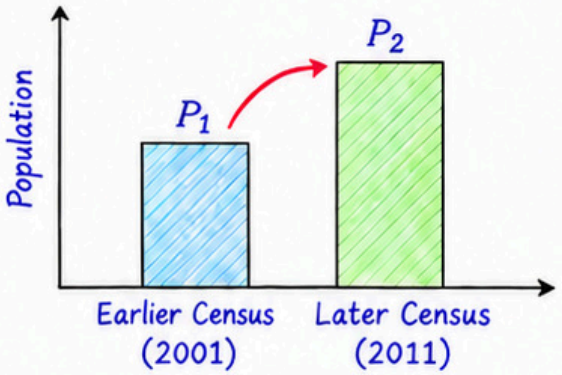
Key measure: Urban share

$$\text{Urban share} = \frac{\text{Urban population}}{\text{Total population}} \times 100$$



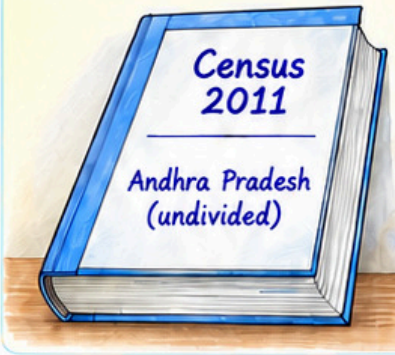
Decadal growth

$$\text{Decadal growth} = \frac{\text{Population in later Census} - \text{Population in earlier Census}}{\text{Population in earlier Census}} \times 100$$



2.4 India and Andhra Pradesh compared

The Census of 2011 was taken before the State was divided in 2014. Its "Andhra Pradesh" is the undivided State. In the provisional paper that State had 84,665,533 people; the final figure is 84,580,777.



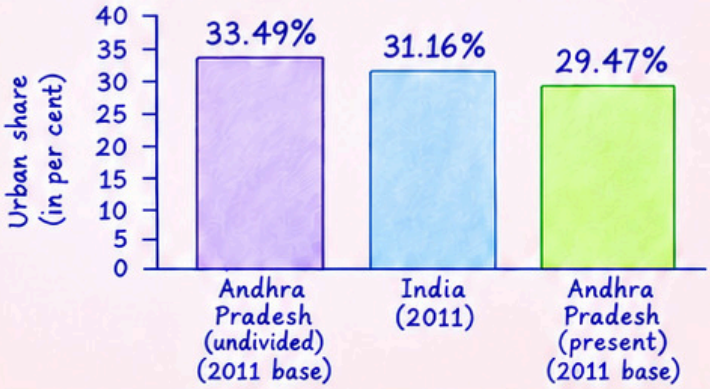
Andhra Pradesh (undivided) – 2011 Population	
Provisional	: 84,665,533
Final	: 84,580,777

The present State's figures are recast: the 2011 data of the areas that now form Andhra Pradesh, 4,95,77,103 people in all On this recast base: 1,46,10,410 urban people out of 4,95,77,103, or 29.47 per cent.

Andhra Pradesh (present)

Present Andhra Pradesh (2011 base)	
Total population	4,95,77,103
Urban population	1,46,10,410
Urban share	29.47%

So "Andhra Pradesh's urban share in 2011" has two correct answers, and they fall on opposite sides of India's 31.16 per cent: the undivided State was above it, the present State below it. Always ask which State and which base.



The two States are not the same areas, so the gap between 33.49 and 29.47 is not a change over time. Both figures describe 2011.

Andhra Pradesh (undivided) (2011 base)

Andhra Pradesh (present) (2011 base)

Growth in the undivided State: its rural population barely grew in 2001–11, while its urban population grew faster than India's.



Rural population (undivided State): barely grew (2001–11)



Urban population (undivided State): grew faster than India's (2001–11)

Undivided AP rural: barely grew

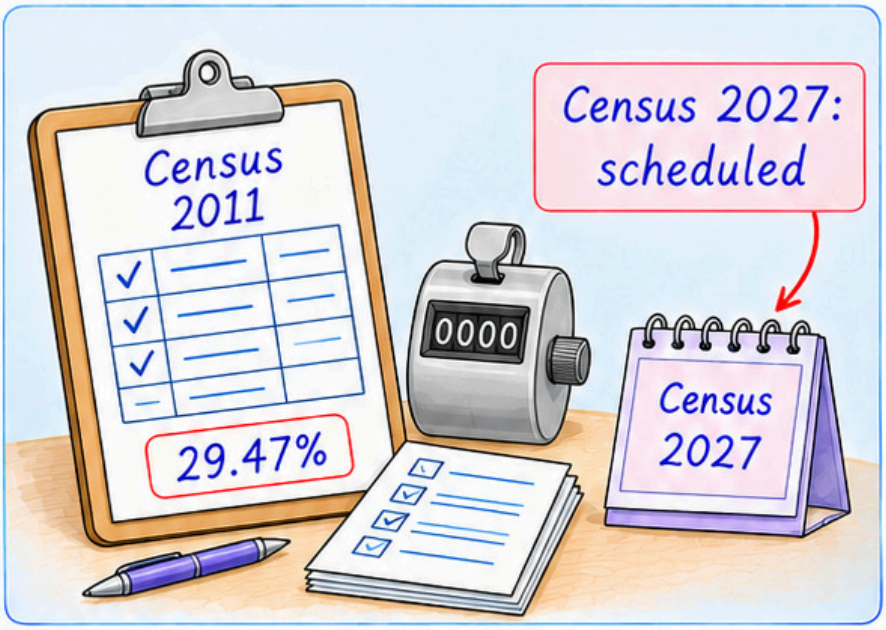
Undivided AP urban: grew faster than India urban

Period:2001–11

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2.4 India and Andhra Pradesh compared

The present State's urban share was 29.47% in Census 2011. No newer Census population count is available as of 7 November 2026. Census 2027 is scheduled.



Within the State, Visakhapatnam was the most urbanised district of 2011 and Srikakulam the least.



Visakhapatnam (most urbanised)

Srikakulam (least urbanised)



District comparison uses 2011 district boundaries.

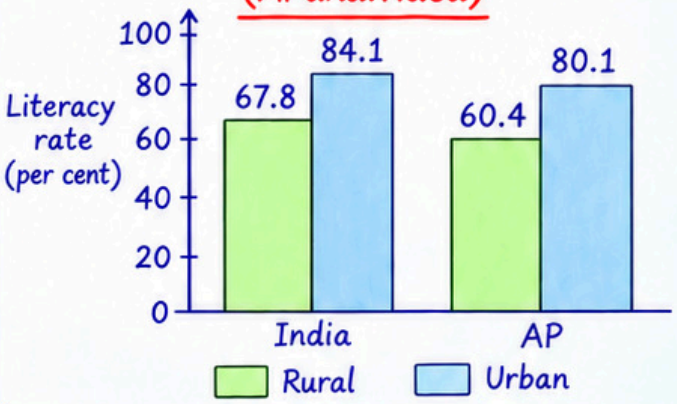
2.5 The rural-urban contrast

The rural-urban contrast refers to the systematic differences in key social indicators between rural and urban areas, such as literacy and sex ratio, which are evident in India and in Andhra Pradesh (AP).

Census2011 | AP: undividedState |
Keep final and provisional figures separate.

Measure	India rural	India urban	AP rural	AP urban	Base
Literacy rate, final (per cent)	67.8	84.1	60.4	80.1	Census 2011; AP undivided
Literacy rate, provisional (per cent)	68.91	84.98	61.14	80.54	Census 2011, provisional; AP undivided
Sex ratio, females per 1,000 males	949	929	—	—	Census 2011
Child sex ratio, 0-6 years, provisional	919	902	942	946	Census 2011, provisional; AP undivided

Literacy rate; final2011: rural vs urban (APundivided)



Sex ratio: definition and computation

Sex ratio = number of females per 1,000 males.

$$\text{Sex ratio} = \frac{\text{Number of females}}{\text{Number of males}} \times 1{,}000$$

Example: If females = 949 and males = 1,000,

$$\text{Sex ratio} = \frac{949}{1{,}000} \times 1{,}000 = 949.$$

Rural and urban areas: illustrative contrast



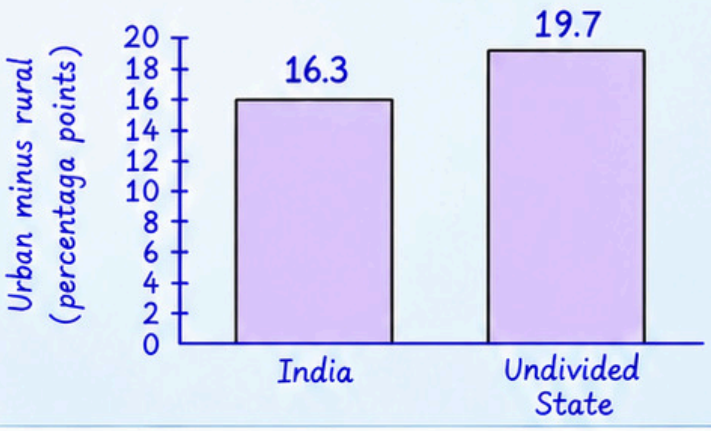


2.5 The rural-urban contrast

Literacy:

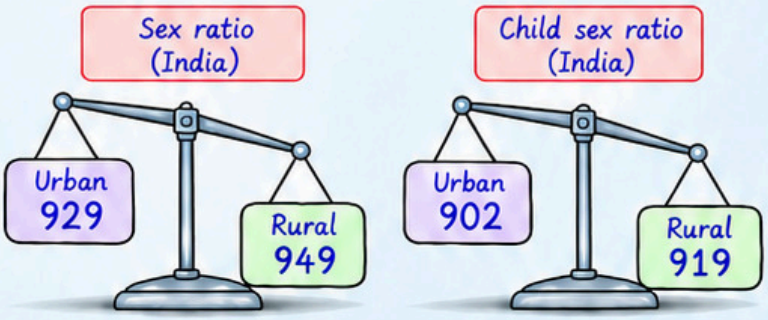
Urban areas lead in both. On the final figures the gap is 16.3 points for India and 19.7 points for the undivided State.

Literacy gap (Urban - Rural)



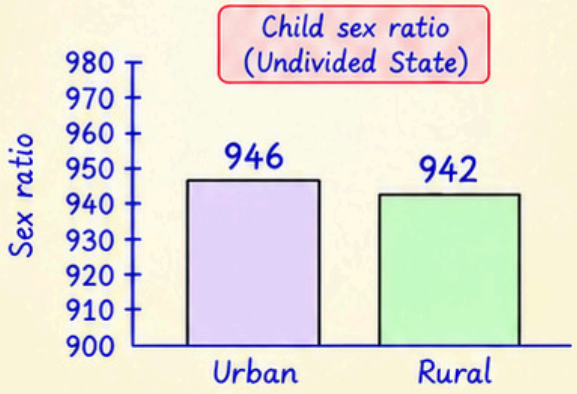
Sex ratio:

In India the urban sex ratio (929) is lower than the rural (949). The child sex ratio is also lower in urban India (902 against 919).



Andhra Pradesh differs on the child sex ratio:

In the undivided State the urban figure (946) was a little above the rural (942).

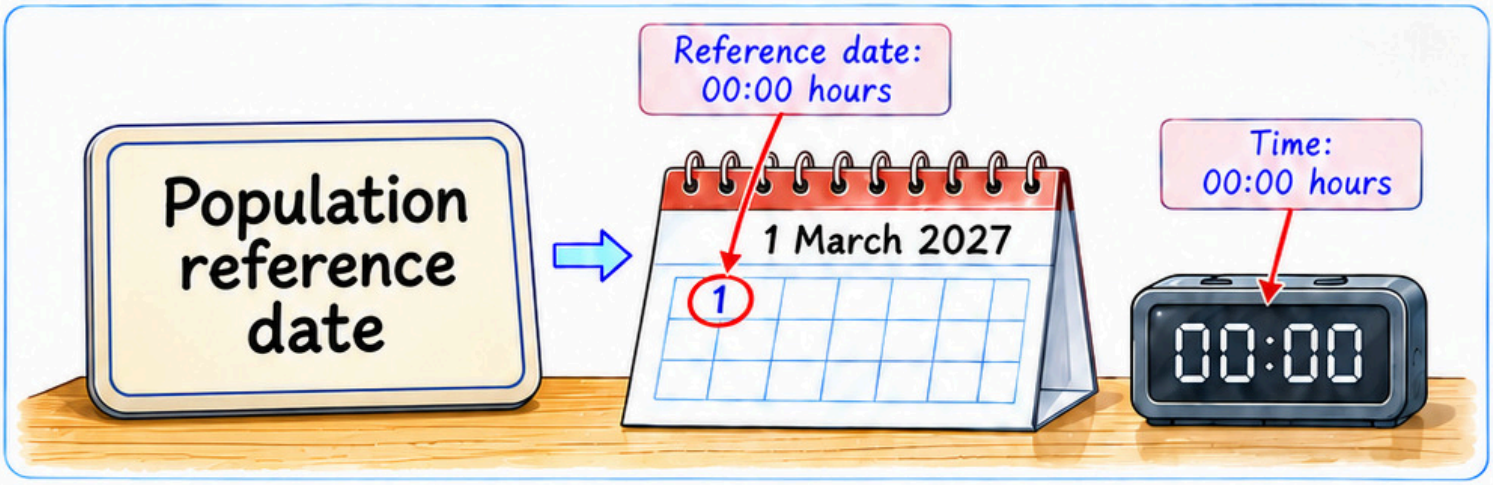


Present State:

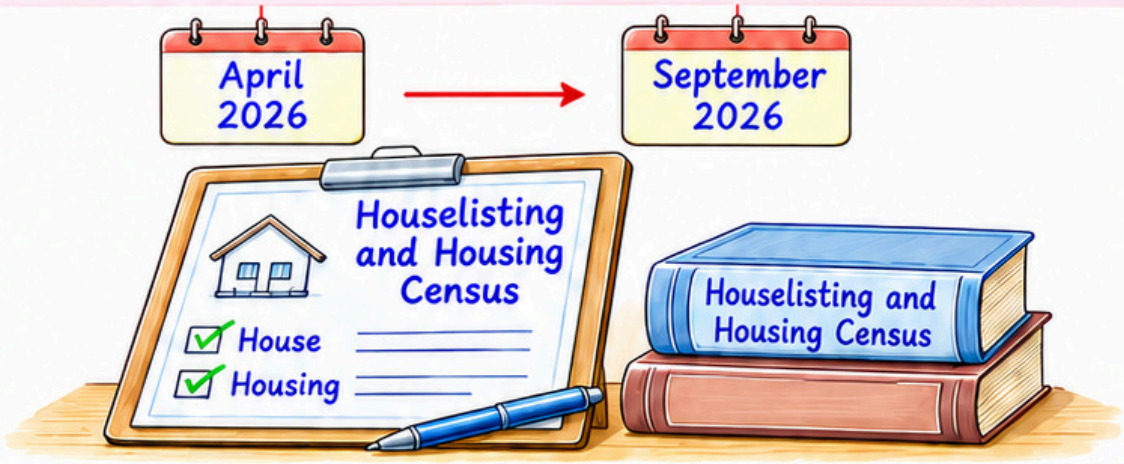
For the present State recast to 2011 boundaries: sex ratio 997 (India 943); literacy 67.35% (India 72.98%). Keep these totals apart from the undivided State's rural and urban figures.

2.6 Census 2027

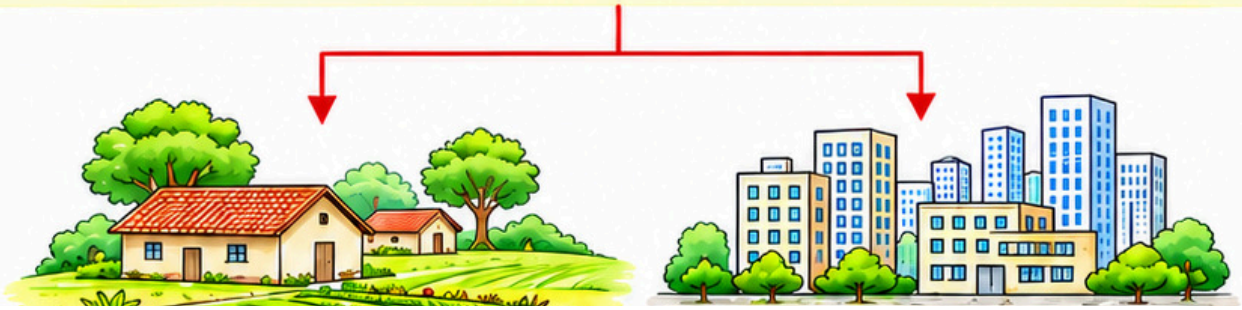
Census 2027 reference date for most of India: 00:00 hours, 1 March 2027.



Houselisting and Housing Census was scheduled for April–September 2026. By 12 August 2026, it had been completed in 31 States and Union territories; completion elsewhere was then scheduled by September 2026. In Manipur, a deferral was reported on 30 October 2026.



Census 2027 will provide the first rural-urban enumeration of the present State of Andhra Pradesh as a separate State.



The rise of census towns, 2001–2011 (1/3)

Kind of town	2001	2011	Increase
Statutory towns	3,799	4,041	242
Census towns	1,362	3,894	2,532
All towns	5,161	7,935	2,774



What the numbers show:

- Census towns nearly tripled (2.86 times), while statutory towns grew by only about 6 per cent.
- Of the 2,774 extra towns, 2,532 (about 91 per cent) were census towns.
- Census towns were about a quarter of all towns in 2001 (26 per cent) and about half in 2011 (49 per cent). Statutory towns were still slightly more numerous in 2011.
- These counts use the provisional 2011 release. Statutory towns remain more numerous than census towns.

Absolute increase in the number of towns

Increase = Count in 2011 − Count in 2001

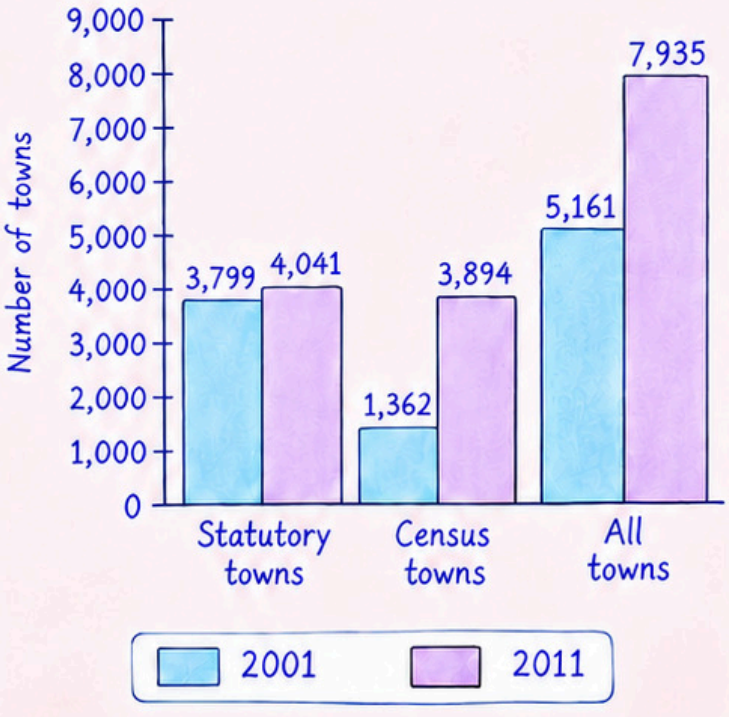
Statutory towns = 4,041 − 3,799 = 242

Census towns = 3,894 − 1,362 = 2,532

All towns = 7,935 − 5,161 = 2,774



Number of towns: 2001 and 2011



The rise of census towns, 2001–2011 (2/3)

Urban: 377,105,760 grew by 31.80 per cent in the decade, so the increase was 377,105,760 × 31.80 ÷ 131.80, about 91.0 million. This matches the 286.11 million urban people of 2001.



Increase (Urban) = 377,105,760 × 31.80 ÷ 131.80
≈ 91.0 million

Urban (2001) = 286.11 million

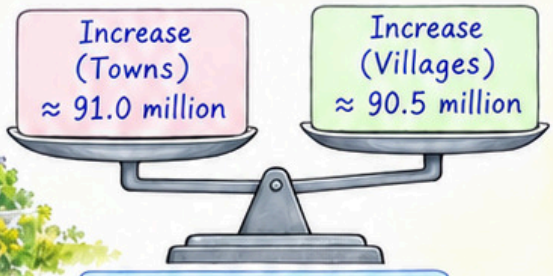
Rural: 833,087,662 grew by 12.18 per cent, so the increase was 833,087,662 × 12.18 ÷ 112.18, about 90.5 million.



Increase (Rural) = 833,087,662 × 12.18 ÷ 112.18
≈ 90.5 million

On provisional 2011 figures, India added about 91.0 million urban residents and 90.5 million rural residents during 2001–11. Urban additions exceeded rural additions for the first time since Independence, by about 0.5 million.





Margin ≈ 0.5 million

- Provisional figures (2011).
- First time since Independence.
- Margin ≈ half a million.

Reclassification expands the urban population



Places previously classified as rural became census towns. Reclassification contributed to growth in the counted urban population.

The rise of census towns, 2001–2011 (3/3)

Much of India's new urban growth came from places being reclassified as urban, not only from cities swelling.

Urban growth from reclassification



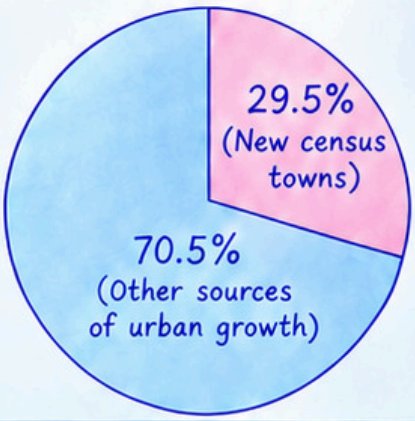
A base estimate indicates, the new census towns accounted for about 29.5 per cent of the growth of the urban population in 2001-11.

Share in growth of urban population (2001–11)

Share of new census towns

$$= \left(\frac{\text{Growth due to new census towns}}{\text{Total growth of urban population in 2001-11}} \right) \times 100$$

$$= 29.5\%$$



Urbanisation through reclassification was greater than urbanisation through migration during 2001-11.

Sources of urbanisation (relative size)

Reclassification > Migration

Qualitative comparison: no ratio specified

Census towns are urban in the Census but may still be governed as rural areas. They need suitable governance arrangements for future growth.



Three key distinctions

1. Mixing provisional and final figures.

The rural and urban provisional counts add up to the provisional total of 1,210,193,422, not to the final total of 1,210,854,977, and the urban share of 31.16 per cent is worked out on that provisional total. In the same way, the undivided State's provisional population was 84,665,533 and its final population 84,580,777; its provisional total growth was 11.10 per cent and is final growth 11.0 per cent. Quote a figure with the set it comes from.

Provisional vs Final

Set	Total population	Urban share (%)
Provisional	1,210,193,422	31.16
Final	1,210,854,977	–

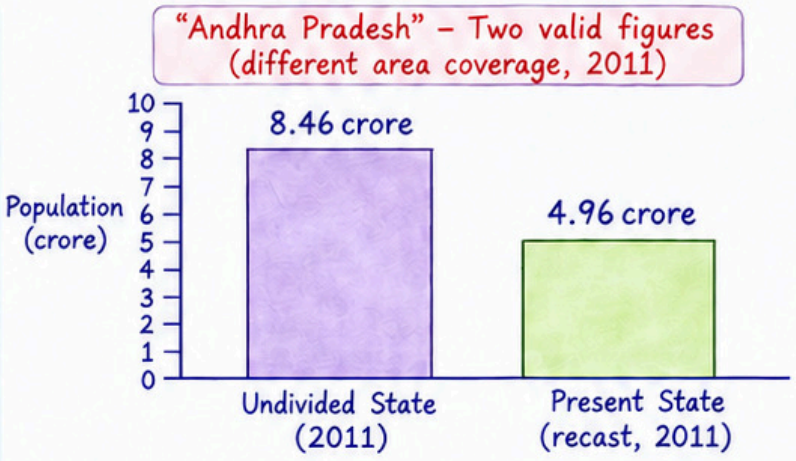
Undivided State – Population and Growth

Set	Population	Total growth (%)
Provisional	84,665,533	11.10
Final	84,580,777	11.0

Urban share (provisional) = 31.16 per cent of 1,210,193,422.

2. Asking "Andhra Pradesh" without asking "which one".

The undivided State had about 8.46 crore people in 2011. The present State recast to 2011 boundaries had about 4.96 crore. These figures cover different geographical areas, not different years.



3. Thinking a census town is a municipal town.

A census town is urban only in the Census count. It has no municipality; the Governor, not the Census, specifies urban areas under Article 243Q. An outgrowth, too, is not a town by itself: it is counted as part of an urban agglomeration with the town it adjoins.

