

**QUICK REVISION MODULE
(UPSC PRELIMS 2024) GEOGRAPHY**

CLIMATE AND GLOBAL CLIMATE ZONES



FACTORS AFFECTING CLIMATE



Latitude



Altitude



Continentality



Ocean
Current



Local
Winds



Relief &
Topography



Natural
Vegetation



Slope, Shelter
& Aspect



El Niño

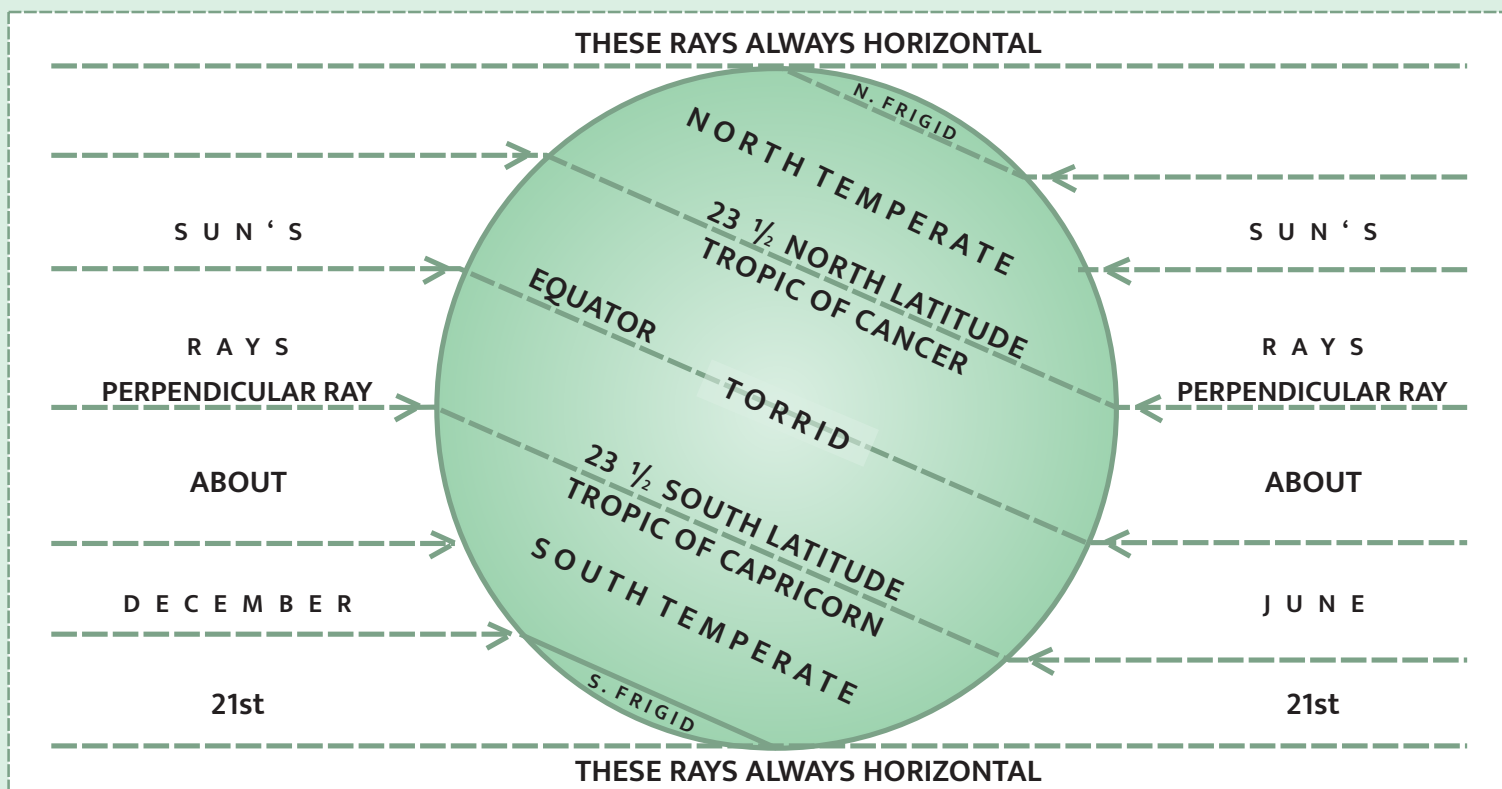


Human
Influence

FACTS ABOUT FACTORS AFFECTING CLIMATE:

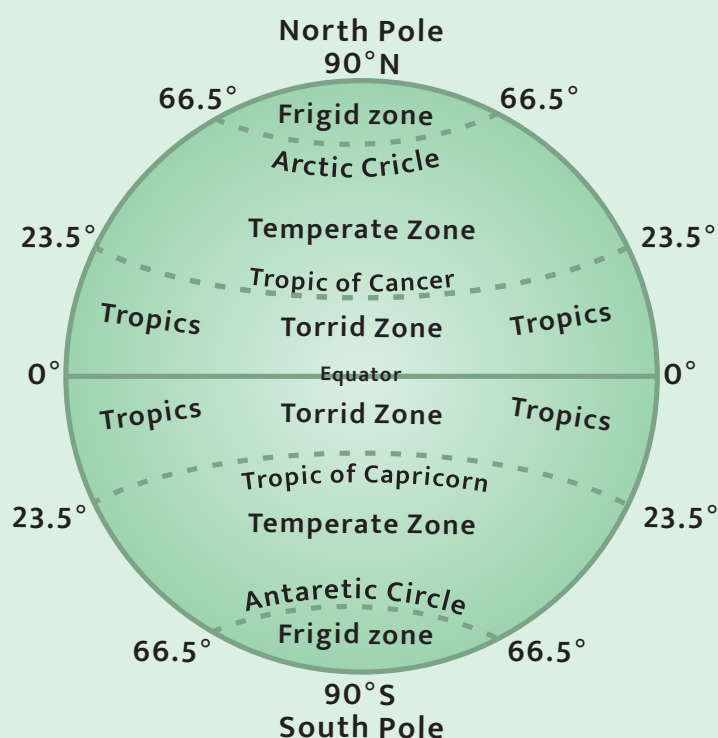
- A fall of 6.5°C occurs with an ascent of 1000 meters or 1.0°C per 165 meters.
- It takes less energy to raise the temperature of a given volume of land by 1.0°C as compared to same volume of water body.
- Mountains receive more rainfall than low lying areas because as air is forced over the higher ground it cools, causing moist air to condense and fall out as rainfall.
- Dry soils like sands are very sensitive to temperature changes, whereas wet soils, like clay, retain much moisture and warm up or cool down more slowly.
- Mountain ranges that have an east-west alignment like the Alps show a higher temperature on the south-facing 'sunny slope' than the north facing 'sheltered slope'.
- The warmer water pumps energy and moisture into the atmosphere, altering global wind and rainfall patterns.

Heat Zones Classifications



SOME FACTS ABOUT HEAT ZONES CLASSIFICATION:

- **Tropical or Torrid Zone:** The sunrays are almost vertical throughout the year. The temperature always remains high. There is no winter season in this zone.
- **Frigid Zones:** The sunrays in these two zones in the Northern and Southern Hemisphere fall in slanting form throughout the year. Therefore these zones experience very low temperature and high degree of coldness.



CLASSIFICATION OF CLIMATE:

Koeppen classification

Based on annual averages of temperature and precipitation. 5 main climate types + Highland type climate

S.N.	Chief Climatic Groups	Climatic Types
A	Tropical Climate (Average temperature of the coldest month is 18°C or higher)	1. Tropical rain forest type climate 2. Savannah type climate 3. Monsoon type climate
B	Dry Climate (potential evaporation) exceeds precipitation	4. Desert climate 5. Steppe (Semi-desert) climate
C	Temperate Climate (The average temperature of the coldest month is higher than minus 3°C but below 18°C)	6. Mediterranean climate 7. China type climate 8. West European type climate
D	Continental Climate (The average temperature of the coldest month is minus 3°C or below)	9. Taiga climate 10. Eastern coastal cold climate 11. Continental climate
E	Polar Climate (Average temperature for all month is below 10°C)	12. Tundra climate 13. Snow-capped region type climate
H	Highland Climate (Cold due to elevation)	

Thornthwaite Classification

5 humidity region based on Precipitation effectiveness and Temperature efficiency

S.N.	Humidity Region	Special type of Vegetation
A	Very Humid	Rain Forest
B	Humid	Forest
C	Semi Humid	Grassland
D	Semi Dry	Steppe
E	Dry	Desert

On the basis of distribution of seasonal rainfall the above types of humidity regions were further divided into following subdivisions:

- Y = Heavy rainfall in all seasons
- s = Scarcity of rainfall in summer season
- w = Scarcity of rainfall in winter season
- d = Scarcity of rainfall in all seasons

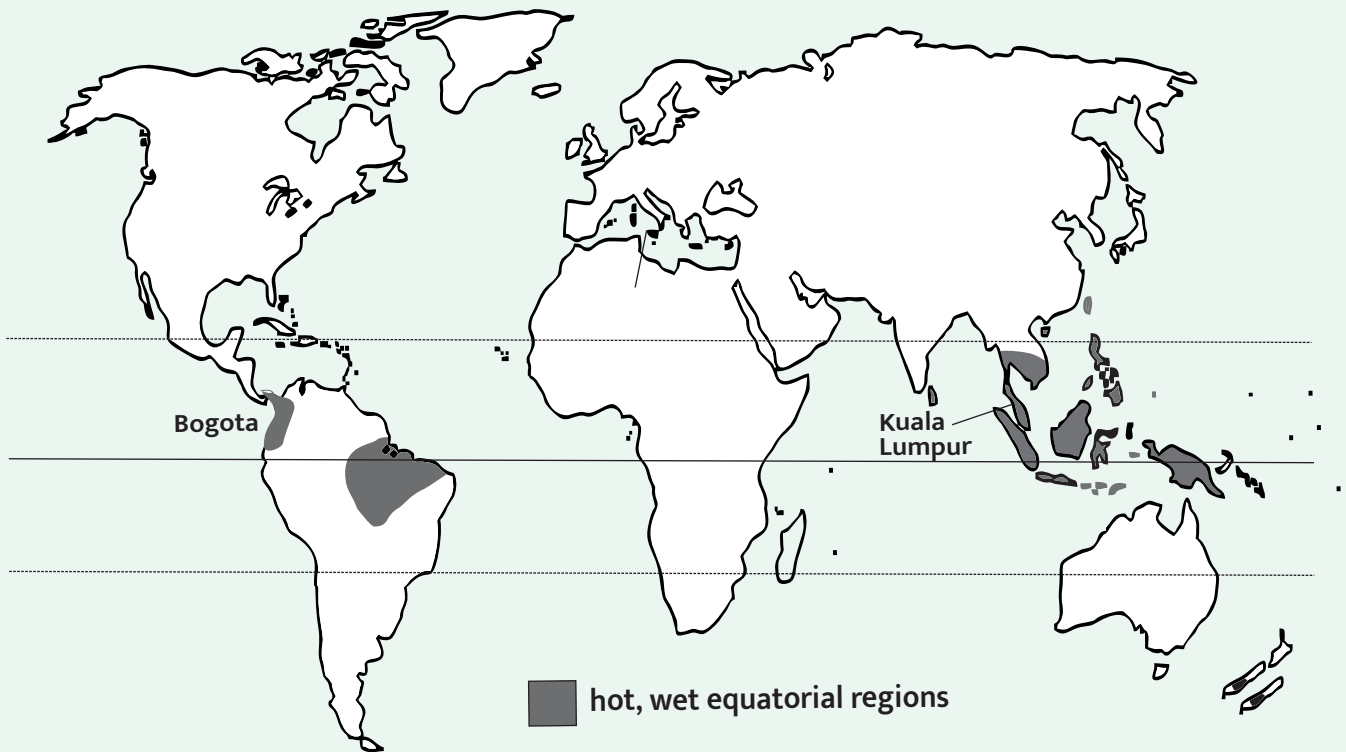
After linking precipitation effectiveness and seasonal distribution of rainfall to temperature anomalies, the climates could be of 120 different types.

1. The Hot, Wet Equatorial Climate



Location

Found in the lowlands of the Amazon, the Congo, Malaysia and the East Indies



Climatic Conditions

- 5-10 degrees North and South of the equator.
- Great uniformity of temperature throughout the year (around 27°C).
- No winter. Cloudiness and heavy precipitation moderates the daily temperature.



Vegetation

- Multitude of evergreen trees that yield tropical hardwood.
- Lianas, epiphytic and parasitic plants are also found.

2. The Tropical Monsoon and Tropical Marine Climates



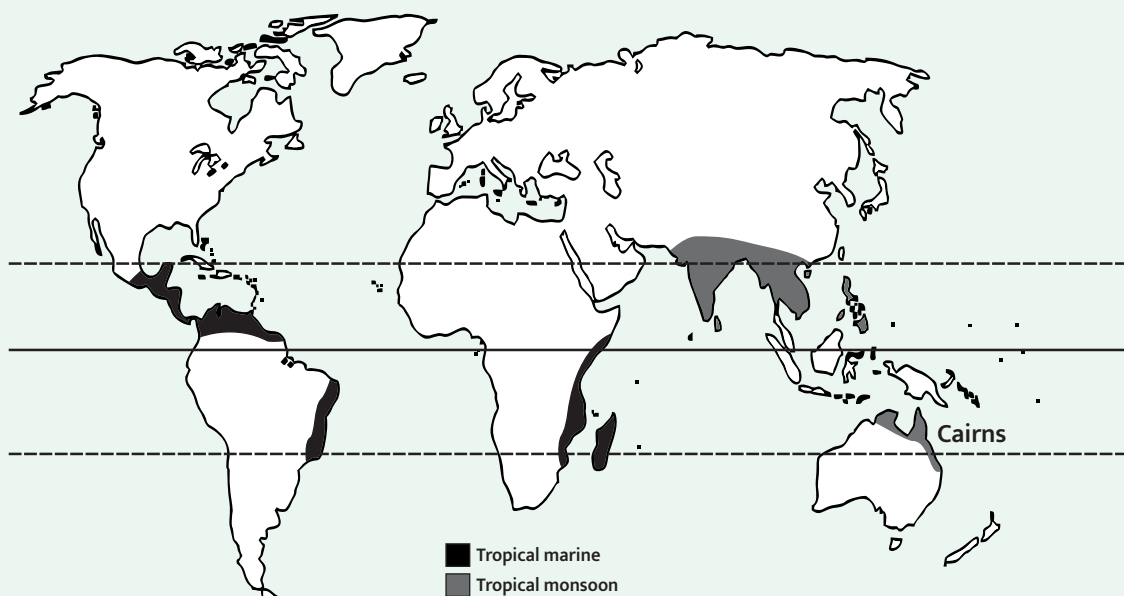
Location

Tropical Monsoon Climate:

- They are best developed in the Indian sub-continent, Burma, Thailand, Laos, Cambodia, parts of Vietnam and south China and northern Australia.

Tropical Marine Climate:

- It is experienced in Central America, West Indies, north-eastern Australia, the Philippines, parts of East Africa, Madagascar, the Guinea Coast and eastern Brazil.



■ Tropical marine
■ Tropical monsoon



Climatic Conditions

- Found in the zones between 5° and 30° latitudes on either side of the equator.
- The basic cause of monsoon climates is the difference in the rate of heating and cooling of land and sea.
- Tropical Monsoon Climate: In regions like the Indian sub-continent which have a true Tropical Monsoon Climate, three distinct seasons are distinguishable - The cool, dry season (October to February), the hot dry season (March to mid-June) and the rainy season (mid-June to September).
- Tropical Marine Climate: This type of climate is experienced along the eastern coasts of tropical lands, receiving steady rainfall from the Trade Winds all the time.



Vegetation

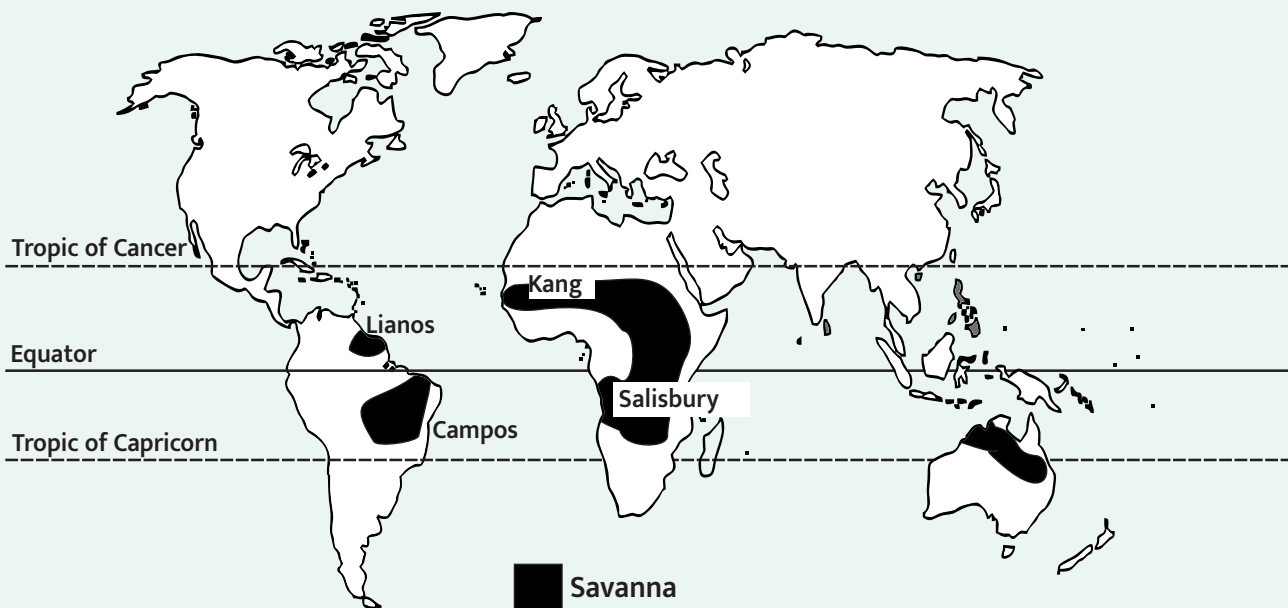
- Trees are normally deciduous because of the marked dry period, during which they shed their leaves to withstand the drought.
- Where the rainfall is heavy, e.g. in Southern Burma, peninsular India, northern Australia and coastal regions with a tropical marine climate, the resultant vegetation is forest.

3. The Savannah or Sudan Climate



Location

- The Savannah or Sudan Climate is a transitional type of climate found between the equatorial forest and the trade wind hot deserts
- It is confined within the tropics and is best developed in the Sudan where the dry and wet seasons are most distinct, hence its name the Sudan Climate.
- The belt includes West African Sudan, and then curves southwards into East Africa and southern Africa north of the Tropic of Capricorn.
- In South America, there are two distinct regions of savannah north and south of the equator, namely the Llanos of the Orinoco basin and the Campos of the Brazilian Highlands.



Climatic Conditions

- It is characterized by distinct wet and dry seasons.
- The extreme diurnal range of temperature is also a characteristic of Sudan type of climate.
- The prevailing winds of the region are the Trade Winds which bring rain to the coastal districts.
- The savannah, particularly in Africa, is the home of wild animals. It is known as the 'big game country'.



Vegetation

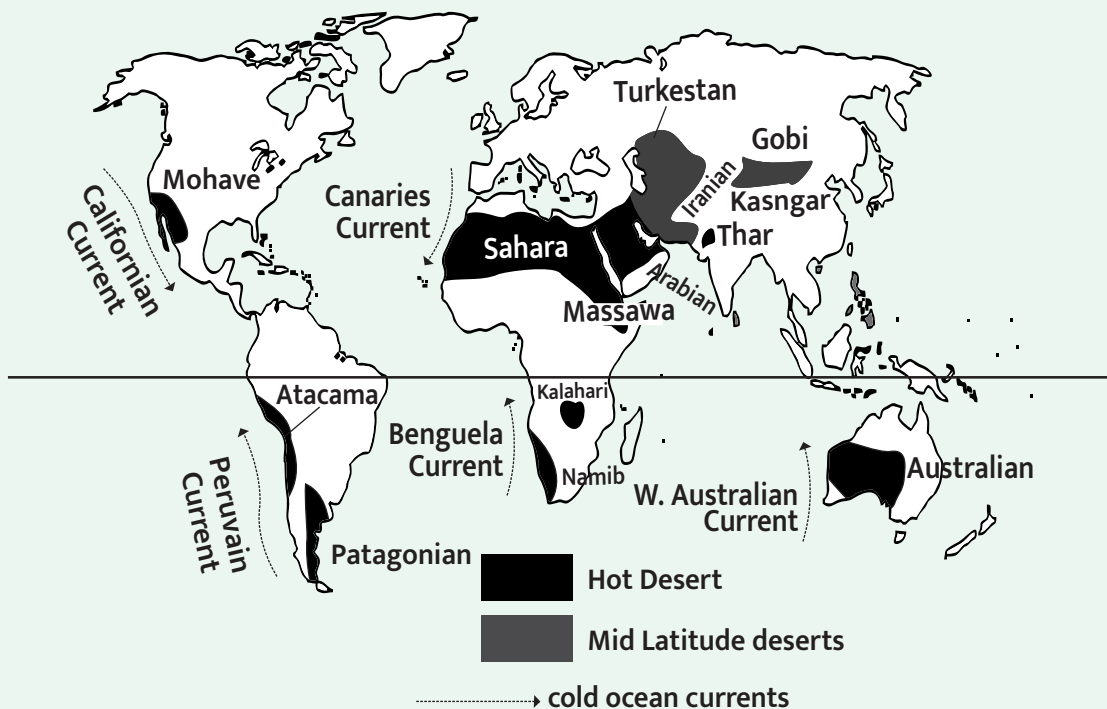
- Tall grass and short trees. The terms 'parkland' or 'bush-veld' is also used.
- The trees are deciduous and show adaptation to withstand drought.

4. The Hot Desert and Mid-latitude Desert Climates



Location

- They include the Sahara Desert, the Great Australian Desert, the Arabian Desert, Iranian Desert, Thar Desert, Kalahari and Namib Deserts.
- In North America, the desert extends from Mexico to USA and is called by different names at different places, e.g. the Mohave Sonoran, Californian and Mexican Deserts.
- In South America, the Atacama or Peruvian Desert (driest). The Patagonian Desert is more due to its rain-shadow position on the leeward side of the lofty Andes than to continentality



Climatic Conditions

- The major hot deserts of the world are located on the western coasts of continents between latitudes 15 and 30 degrees N and S.
- The hot deserts lie astride the Horse Latitudes or the Sub Tropical High Pressure Belts where the air is descending (least favourable for precipitation)
- There is no cold season in the hot deserts and the average summer temperature is around 30°C.



Vegetation

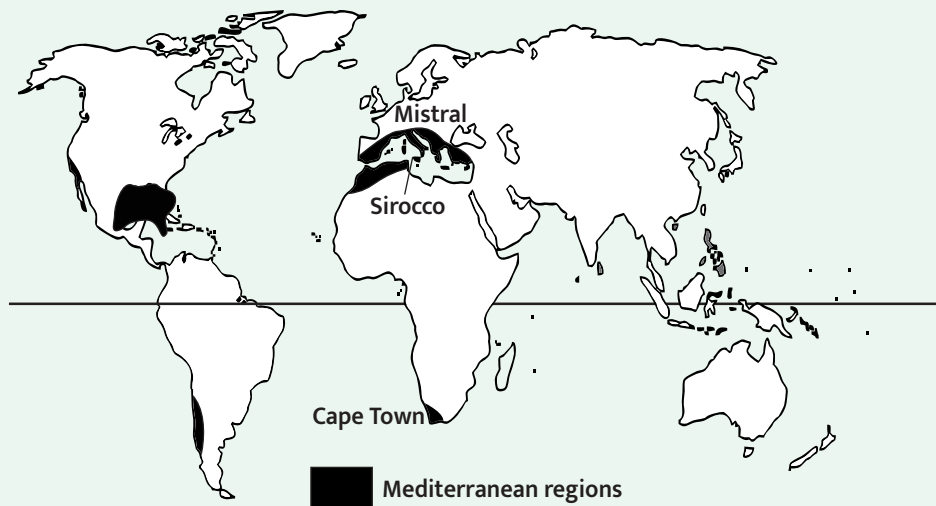
- Vegetation include grass, scrub, herbs, weeds, roots or bulbs.

5. The Warm Temperate Western Margin (Mediterranean) Climate



Location

- The basic cause of this type of climate is the shifting of the wind belts.
- Though the area around the Mediterranean Sea has the greatest extent of this type of 'winter rain climate', and gives rise to the more popular name Mediterranean Climate.
- Other Mediterranean regions include California (around San Francisco), the south-western tip of Africa (around Cape Town), southern Australia (in southern Victoria and around Adelaide, bordering the St. Vincent and Spencer Gulfs), and south-west Australia (Swanland).



Climatic Conditions

- They are entirely confined to the western portion of continental masses, between 30° and 45° north and south of the equator.
- The Mediterranean type of climate is characterized by very distinctive climatic features - a warm summer with off-shore trades, a concentration of rainfall in winter with onshore westerlies, bright, sunny weather with hot dry summers and wet, mild winters and the prominence of local winds around the Mediterranean Sea (Sirocco, Mistral).
- Growth is slow in the cooler and wetter season, even though more rain comes in winter. The warm, bright summers and cool, moist winters enable a wide range of crops to be cultivated. Some 85 per cent of grapes produced, go into wine. The long, sunny summer allows the grapes to ripen and then they are handpicked. Economy: The area is important for fruit cultivation, cereal growing, wine-making and agricultural industries as well as engineering and mining.



Vegetation

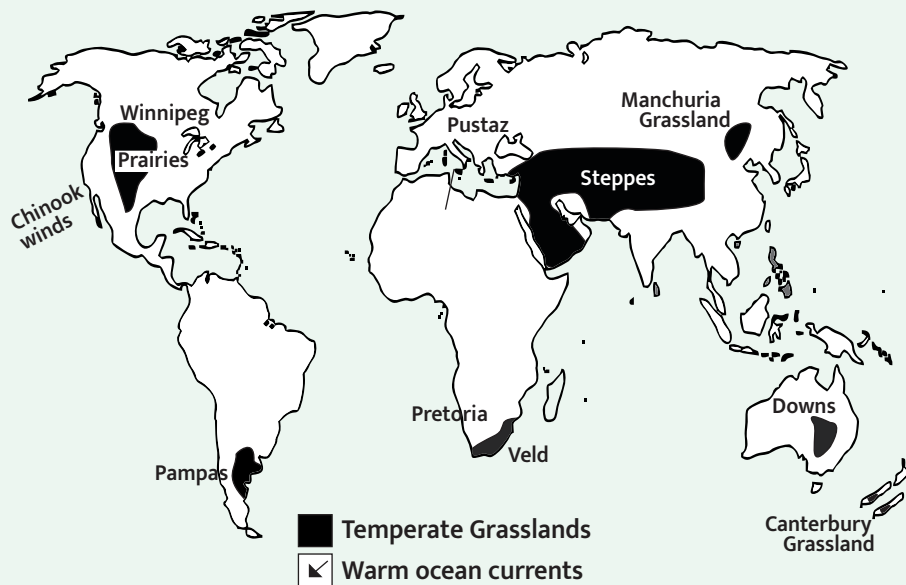
- The Mediterranean lands are also known as the world's orchard lands. A wide range of citrus fruits such as oranges, lemons, limes, citrons and grapefruit are grown. Wine production is another specialty.
- The absence of shade is a distinct feature of Mediterranean lands.

6. The Temperate Continental (Steppe) Climate



Location

- In Eurasia: Steppes. Stretch eastwards from the Black Sea to the Altai Mountains.
- In North America: Prairies. They lie between the Rockies and the Great Lakes.
- In South America: Pampas of Argentina and Uruguay. Extend right to the sea and enjoy much maritime influence.
- In South Africa: Tropical Bushveld in North and High Veld in the South. They lie between the Drakensberg and the Kalahari Desert.



Climatic Conditions

- Summers are very warm and winters are very cold in the continental steppes of Eurasia because of the enormous distances from the nearest sea.
- In contrast, the steppe type of climate in the southern hemisphere is never severe. The winters are mild. Temperatures below freezing point are exceptional.
- Temperate grasslands are found bordering the deserts, away from the Mediterranean regions and in the interiors continents.
- Their greatest difference from the tropical savannah is that they are practically treeless and the grasses are much shorter.



Vegetation

- Trees are very scarce in the steppes, because of the scanty rainfall, long droughts and severe winters.
- Tall, fresh and nutritious prairie grass are found. Granaries of the world.

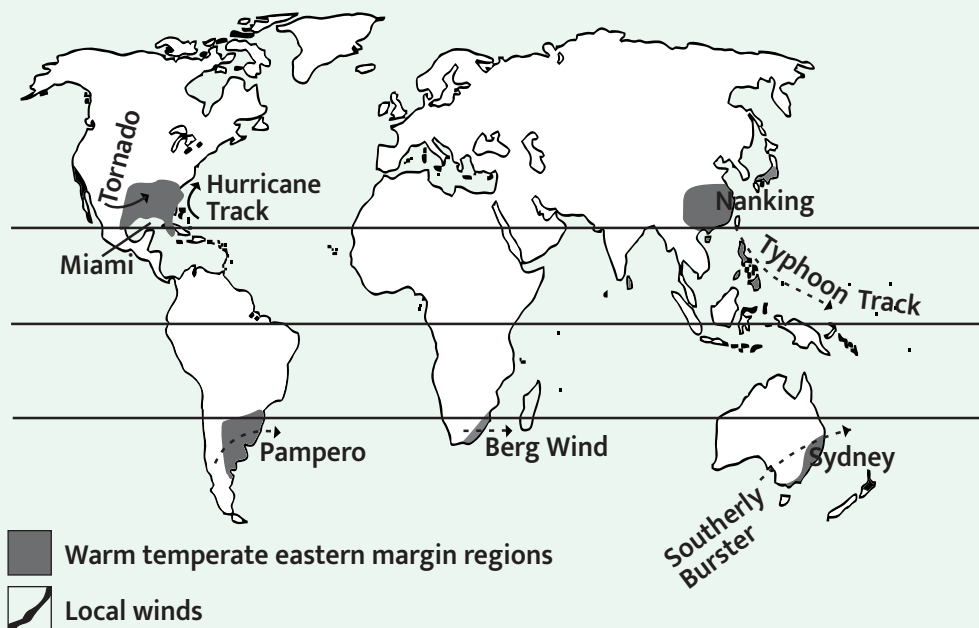
7. The Warm Temperate Eastern Margin (China Type) Climate



Location

It can be sub-divided into three main types:

- The China type: Central and North China including southern Japan (temperate monsoonal).
- The Gulf type: South-eastern United States bordering Gulf of Mexico (slight monsoonal).
- The Natal type: The entire warm temperate eastern margin (non-monsoonal areas) of the southern hemisphere including Natal, eastern Australia and southern Brazil-Paraguay-Uruguay and northern Argentina.



Climatic Conditions

- Warm moist summer and a cool, dry winter.
- Fairly uniform distribution of rainfall throughout the year.
- It has comparatively more rainfall than the Mediterranean climate.
- The eastern margins of warm temperate latitudes have a much heavier rainfall than either the western margins or the continental interiors and thus have luxuriant vegetation.



Vegetation

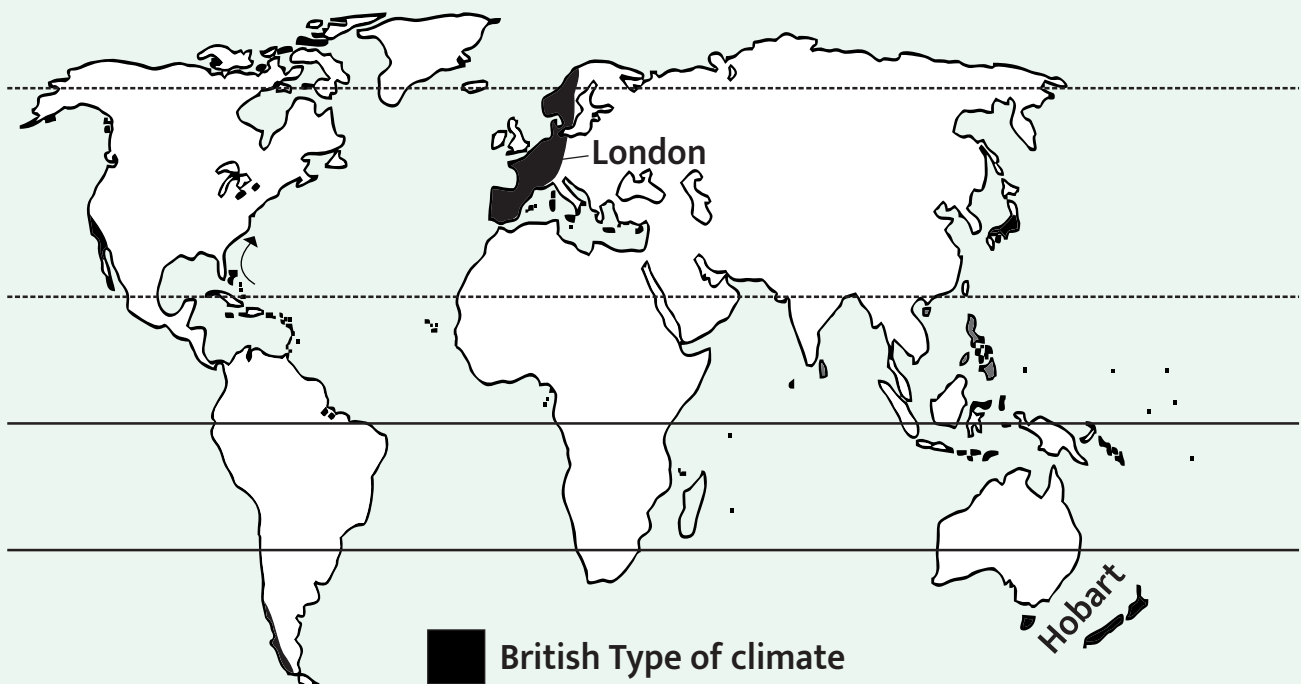
- Lowlands: Evergreen broad-leaved forests and deciduous trees.
- Highlands: Conifers such as pines and cypresses that are important softwood.

8. The Cool Temperate Western Margin (British Type) Climate



Location

- Permanent influence of Westerlies through out the year.
- They are also regions of much cyclonic activity, typical of Britain.
- Climatic belt stretches from Britain to North-West Europe.
- In the southern hemisphere, the climate is experienced in southern Chile, Tasmania and most parts of New Zealand, particularly in South Island.



Climatic Conditions

- Summers are never very warm.
- Adequate rainfall throughout the year with a tendency towards a slight winter or autumn maximum from cyclonic sources.
- The rain-bearing winds come from the west, the western margins have the heaviest rainfall.



Vegetation

- Deciduous forests used for Lumbering
- Trees shed their leaves in winter as a protection mechanism.

9. The Cool Temperate Continental (Siberian) Climate



Location

- Experienced only in the northern hemisphere where the continents within the high latitudes have a broad east-west spread.
- The Siberian Climate is conspicuously absent in the southern hemisphere because of the narrowness of the southern continents in the high latitudes.



Climatic Conditions

- Characterized by a bitterly cold winter of long duration, and a cool brief summer. Spring and autumn are merely brief transitional periods.
- The extremes of temperature are so great in Siberia that it is often referred to as the 'cold pole of the earth'.
- Some of the lowest temperatures in the world are recorded in Verkhoyansk.



Vegetation

- Coniferous forests (Softwood)
- There are four major species in the coniferous forests – a) Pine, e.g. white pine, red pine b) Fir, e.g., Douglas fir and balsam fir, c) Spruce and d) Larch.

10. The Cool, Temperate Eastern Margin Climate



Location

This climate is found only in two regions.

- **North American Region:** north-eastern North America, including eastern Canada, north-east U.S.A. and Newfoundland.
- **Asiatic Region:** The eastern coastlands of Asia, including eastern Siberia, North China, Manchuria, Korea and northern Japan.

In the southern hemisphere, this climatic type is absent because only a small section of the southern continents extends south of the latitude of 40° S.



Climatic Conditions

- This climate has cold, dry winters and warm, wet summers
- It has features of both the maritime and the continental climates.
- It is an intermediate type of climate between the British and the Siberian type of climate.



Vegetation

- The predominant vegetation of the Laurentian type of climate is cool temperate forest.
- Oak, beech, maple and birch are the principal trees.

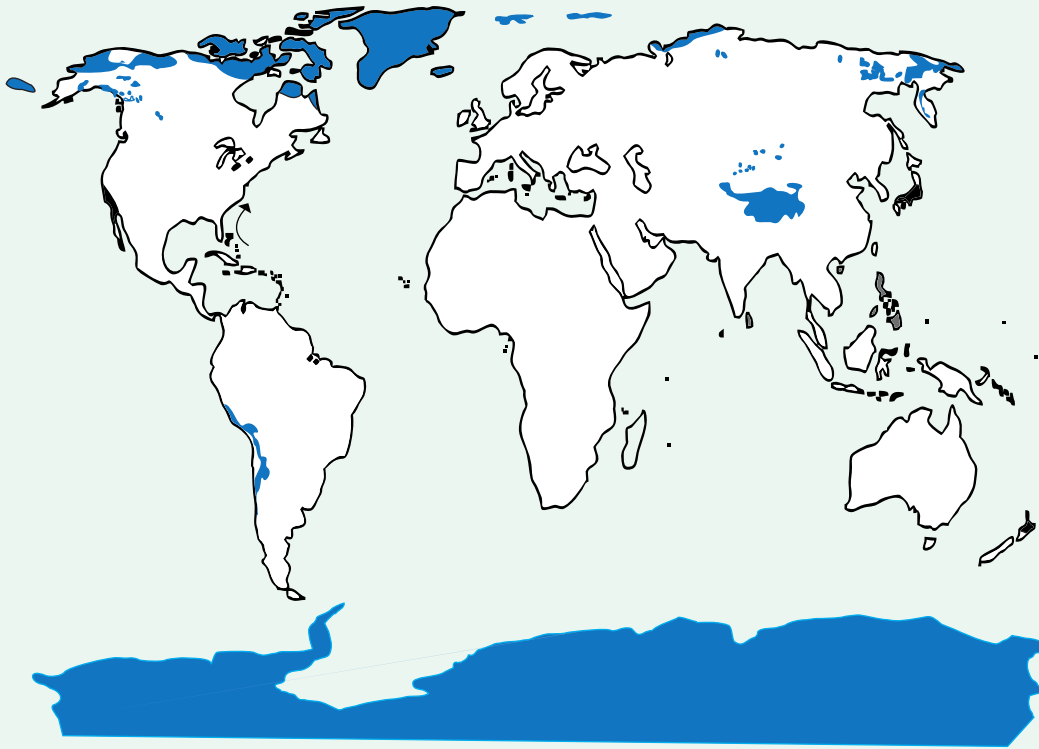
11. The Polar Climate



Location

Two subtypes:

- Tundra Climate
- Ice-Cap Climate



Climatic Conditions

Exists poleward beyond 70° latitude.

- Tundra-Climate [ET] is found in regions with permafrost. Short growing season i.e. summer with very long duration of day light. Drainage in the tundra is usually poor as the sub-soil is permanently frozen.
- The ice cap climate (EF) occurs over interior Greenland and Antarctica. Even in summer, the temperature is below freezing point.



Vegetation

- Tundra vegetation i.e. Mosses, Lichens and flowering plants.

The Global climatic conditions can be studied under the following twelve classifications.

Climatic Zone	Latitude (Approachmate)	Climatic Type	Rainfall Regime (with approx. total)	Natural Vegetation
Equatorial Zone	0°-10°N and S	1. Hot wet equatorial	Rainfall all year round: 80 inches	Equatorial rain forests
Hot Zone	10°-30°N and S	2. a) Tropical Monsoon b) Tropical Marine	Heavy summer rain: 80 inches Much summer rain: 70 inches	Monsoon forests
		3. Sudan Type	Rain mainly in summer: 30 inches	Savanna (tropical grassland)
		4. Desert: a) Saharan type b) Mid-latitude type	Little rain: 5 inches	Desert vegetation and scrub
Warm Temperate Zone	10°-40°N and S	5. Western Margin (Mediterranean type)	Winter rain: 35 inches	Mediterranean forests and shrub
		6. Central Continental (Steppe type)	Light summer rain: 20 inches	Steppe or temperate grassland
		7. Eastern Margin: a) China type b) Gulf type c) Natal type	Light summer rain: 20 inches	Warm, wet forests and bamboo
Cool Temperate Zone	45°-65°N and S	8. Western Margin (British type)	More rain in autuma & winter: 30 inches	Deciduous forests
		9. Cental Continental (Siberian type)	Light summer rain: 25 inches	Evergreen coniferous forests
		10. Eastern Margin (Laurentian type)	Moderate summer rain: 40 inches	Mixed forests (coniferous and deciduous)
Cool Zone	65°-90°N and S	11. Arctic or Polar	Very light summer rain: 10 inches	Tundra, mosses, lichens
Alpine Zone	65°-90°N and S	12. Mountain climate	Heavy rainfall (variable)	Alpine pastures, conifers, fern, show