

# Climatic Regions

# Tropical Wet Climate

- Also known as ‘The Hot, Wet Equatorial Climate’, ‘Equatorial Rainforest Climate’.
- The regions are generally referred as ‘Equatorial Rainforests’, ‘Equatorial Evergreen Forests’, ‘Tropical Moist Broadleaf Forest’, ‘Lowland Equatorial Evergreen Rainforest’.

# Distribution

- Mostly between 5° N and S of Equator.
- [little or no Coriolis Force == no tropical cyclones]
- Its greatest extent is found in the lowlands of the Amazon, the Congo, Malaysia and the East Indies.

# Temperature

- Temperature is uniform throughout the year.
- The mean monthly temperatures are always around 27° C with very little variation.
- There is no winter. [Typical to Equatorial Rainforest Climate]
- Cloudiness and heavy precipitation moderate the daily temperature.
- Regular land and sea breezes assist in maintaining a truly equable climate.
- The diurnal range of temperature is small, and so is the annual range.

# Precipitation

- Precipitation is heavy and well distributed throughout the year.
- Annual average is always above 150 cm. In some regions the annual average may be as high as 250 – 300 cm.
- There is no month without rain (distinct dry season is absent).
- There are two periods of maximum rainfall, April and October. [shortly after the equinox]. Least rain fall occurs in June and December [solstice].
- The double rainfall peaks coinciding with the equinoxes are a characteristic feature of equatorial climates not found in any other type of climate.
- There is much evaporation and convectional air currents are set up, followed by heavy thunderstorms in the afternoons.

# Equatorial Vegetation

- High temperature and abundant rainfall support a luxuriant tropical rain forest.
- In the Amazon lowlands, the forest is so dense that it is called 'selvas'. [selvas: A dense tropical rainforest usually having a cloud cover (dense canopy)]
- Unlike the temperate regions, the growing season here is all the year round seeding, flowering, fruiting and decaying do not take place in a seasonal pattern.

- The equatorial vegetation comprises a multitude of evergreen trees that yield tropical hardwood, e.g. mahogany, ebony, dyewoods etc.
- Many parts of the tropical rain forests have been cleared either for lumbering or shifting cultivation.
- In the coastal areas and brackish swamps, mangrove forests thrive.
- From the air, the tropical rain forest appears like a thick canopy of foliage, broken only where it is crossed by large rivers or cleared for cultivation.

- All plants struggle upwards (most epiphytes) for sunlight resulting in a peculiar layer arrangement.
- The tallest trees attain a height close to 50 m.
- The smaller trees beneath form the next layer.
- The ground is rooted with ferns and herbaceous plants which can tolerate shade.
- Because the trees cut out most of the sunlight the undergrowth is not dense.

# Multiple species

- Though the tropics have great potential in timber resources, commercial extraction is difficult.
- Multiple species of trees occur in a particular area (trees do not occur in homogenous stands or pure stands) making commercial exploitation a difficult task.
- Many of the tropical hardwoods (very heavy) do not float readily on water and this makes transportation an expensive matter.
- It is therefore not surprising that many tropical countries are net timber importers.

# Life and Economy

- The forests are sparsely populated. In the forests most primitive people live as hunter gatherers and the more advanced ones practice shifting cultivation.
- Food is abundantly available. People generally don't stock food for the next day.

## Commercial activity

- In the Amazon basin the Indian tribes collect wild rubber,
- In the Congo Basin the Pygmies gather nuts
- In the jungles of Malaysia the Orang Asli make all sorts of cane products and sell them to people in villages and towns.

# Plantation

- The climate is very Favourable for the cultivation of certain crops that are highly valued in the industrial West.
- The most important is natural rubber. Malaysia and Indonesia are the leading producers.
- Cocoa is another important crop which is cultivated in West Africa, bordering the Gulf of Guinea.
- The two most important producers are Ghana and Nigeria

## Plantations Regions

- Palm Malaysia, Indonesia
- Sugarcane Brazil
- Coffee Brazil
- Rubber Malaysia, Indonesia
- Cocoa Ghana, Nigeria

- All the cocoa here goes into American and European chocolate industry.
- From the same area another crop, oil palm, has done equally well and many countries like Indonesia have now taken to its cultivation.
- Other important crops include coconuts, sugar, coffee (Brazil), tea, tobacco, spices, etc.
- The plantations resulted in the destruction of nearly half of equatorial forests.

# Rapid deterioration of tropical soil

- The fertility of top soil in rainforest regions is very poor. Torrential downpours wash out most of the top soil nutrients.
- The soil deteriorates rapidly with subsequent soil erosion and soil impoverishment.
- It takes decades to replenish the soil of lost nutrients.
- So a seed doesn't usually germinate and even if it does, its development is hindered due to little availability of sunlight.

# Difficulties in livestock farming

- Livestock farming is greatly handicapped by an absence of meadow grass.
- The grass is so tall and coarse that it is not nutritious.
- The few animals like buffaloes are kept mainly for domestic use. Their yield in milk or beef is well below those of the cattle in the temperate grasslands.
- In Africa, domesticated animals are attacked by tsetse flies that cause ngana, a deadly disease.

# Mineral resources

- Gold, copper, diamonds, and other precious metals and gemstones are important resources that are found in rainforests around the world.
- Extracting these natural resources is a destructive activity that damages the rainforest ecosystem.
- Examples are gold mining in the Brazilian and Peruvian Amazon, rare earth mining in the Congo, and gold and copper mining in Indonesia and Papua New Guinea.

- Some of the world's most promising oil and gas deposits lie deep in tropical rainforests.

# Tropical Monsoon Climate

- Monsoons are land and sea breezes on a much larger scale.
- Unlike equatorial wet climate, monsoon climate is characterized by distinct wet and dry seasons associated with seasonal reversal of winds.
- Floods in wet season and droughts in dry season are common.
- Usually there are three seasons namely summer, winter and rainy season.

# Distribution of Tropical Monsoon Climate

- Occur within 5° to 30° N and S of the equator.
- On-shore [sea to land] tropical monsoons occur in the summer and off-shore [land to sea] dry monsoons in the winter
- They are best developed in the Indian subcontinent, Burma, Thailand, Laos, Cambodia, parts of Vietnam and south China and northern Australia.



# Temperature

- Monthly mean temperatures above 18 °C
- Temperatures range from 30-45° C in summer. Mean summer temperature is about 30°C.
- In winters, temperature range is 15-30° C with mean temperature around 20-25° C.

# Precipitation

- Annual mean rainfall ranges from 200-250 cm.
- In some regions it is around 350 cm.
- Places like Cherrapunji & Mawsynram receive an annual rainfall of about 1000 cm.
- They lie on the windward side of the Meghalaya hills, so the resulting orographic rainfall

# Seasons

# The cool, dry season (October to February)

- Out blowing dry winds, the North-East Monsoon, bring little or no rain to the Indian sub-continent.
- However, a small amount of rain falls in Punjab from cyclonic sources due to Western Disturbances
- North-East Monsoons blowing over the Bay of Bengal acquires moisture and bring rains to the south-eastern tip of the peninsula at this time of the year (Nov to Dec).



# The rainy season (mid-June to September)

- With the 'burst' of the South-West Monsoon in mid-June, torrential downpours sweep across the country.
- Almost all the rain for the year falls within this rainy season.
- This pattern of concentrated heavy rainfall in summer is a characteristic feature of the Tropical Monsoon Climate.

# Tropical Monsoon Forests

- Broad-leaved hardwood trees. Well developed in southeast Asia.
- Trees are normally deciduous, because of the marked dry period, during which they shed their leaves to withstand the drought
- The forests are more open and less luxuriant than the equatorial jungle and there are far fewer species.
- 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 luxuriant.

- With a decrease in rainfall in summer, the forests thin out into thorny scrubland or savanna with scattered trees and tall grass.
- In parts of the Indian sub-continent, rainfall is so deficient that semi-desert conditions are found in summer.
- Monsoonal vegetation is thus most varied, ranging from forests to thickets, and from savanna to scrubland.

# Population and Economy

- Monsoon climatic regions support high population density.
- Income levels are low as most of these regions are underdeveloped or developing.
- Subsistence farming is the main occupation. (crops grown with an intention to secure food for the season. The crops are not sold as the production is very low).
- Intensive cultivation is common in regions with irrigational facilities.



<b>Region</b>	<b>Name of Shifting Cultivation</b>
---------------	-------------------------------------

- |                    |         |
|--------------------|---------|
| • Malaysia         | Lacking |
| • Burma            | Taungya |
| • Thailand         | Tamrai  |
| • Philippines      | Caingin |
| • Java             | Humah   |
| • Sri Lanka        | Chena   |
| • North-east India | Jhum    |

# Crops

- Rice is the most important staple crop.
- Irrigation water from rivers, canals, dams or wells is extensively used in the major rice producing countries.
- Other food crops like maize, millet, sorghum, wheat, gram and beans are of subsidiary importance.
- They are cultivated in the drier or cooler areas where rice cannot be grown.



# Lumbering

- Most of the forests yield valuable timber, and are prized for their durable hardwood.
- Lumbering is undertaken in the more accessible areas
- This is particularly important in continental South-East Asia. Of the tropical deciduous trees
- teak, of Burma, the leading producer, is perhaps the most sought after.
- It is valuable on account of its great durability, strength, immunity to shrinkage, fungus attack and insects.

- Teak logs are so heavy that they will not float readily on water.
- It is therefore necessary to 'poison' the tree several years before actual felling, so that it is dry and light enough to be floated down the Chindwin and the Irrawaddy to reach the saw mills at Rangoon.
- Other kinds of timber include Neem, Banyan, Mango, Teak, Sal, Acacia, Eucalyptus
- Together with the forests are bamboo thickets, which often grow to great heights.

# Savanna Climate or Tropical Wet and Dry Climate or Sudan Climate

- This type of climate has alternate wet and dry seasons similar to monsoon climate but has considerably less annual rainfall.
- Also, there is no distinct rainy season like in monsoon climate.
- Only two seasons – winter and summer. Rains occur in summer
- Floods and droughts are common.
- Vegetation, wildlife and human life are quite different from monsoon climate regions.

# Distribution of Savanna Climate

- It is confined within the tropics and is best developed in Sudan, hence its name the Sudan Climate.
- It is a transitional type of climate found between the equatorial rainforests and hot deserts.

# Rainfall

- Mean annual rainfall ranges from 80 – 160 cm
- Rainfall decreases with distance from equator
- In the northern hemisphere, the rainy season begins in May and lasts till September.
- In the southern hemisphere, the rainy season is from October to March.

# Temperature

- Mean annual temperature is greater than 18° C.
- Highest temperatures do not coincide with the period of the highest sun (e.g. June in the northern hemisphere) but occur just before the onset of the rainy season, i.e. April in Northern Hemisphere and October in Southern Hemisphere.
- Days are hot and nights are cold. This extreme diurnal range of temperature is another characteristic feature of the Sudan type of climate.

What is the reason for alternating wet and dry seasons in Savanna type climate

- On shore winds in summer bring rains.
- Off-shore winds in winter keep the climate dry.

# Natural Vegetation of Savanna Climate

- The savanna landscape is typified by tall grass and short trees.
- The grasslands are also called as 'bush veld'.
- The trees are deciduous, shedding their leaves in the cool, dry season to prevent excessive loss of water through transpiration, e.g. acacias.
- Trees usually have broad trunks, with water-storing devices to survive through the prolonged drought.



# Animal Life of the Savanna

- The savanna is known as the 'big game country' as thousands of animals are trapped or killed each year by people from all over the world.
- There are two main groups of animals in the savanna, the grass-eating herbivorous animals and the fleshing-eating carnivorous animals

- The herbivorous include the zebra, antelope, giraffe, deer, gazelle, elephant etc. [most of the National geographic and Animal Planet documentaries on wild animals are shot in savanna regions]
- carnivorous animals include the lion, tiger, leopard, hyena, panther, jaguar, jackal etc..
- Species of reptiles and mammals including crocodiles, alligators, giant lizards live together with the larger rhinoceros and hippopotamus in rivers and marshy lakes.

# Life and Economy in the Savanna

- Many tribes live in savanna region. Tribes like the Masai tribes of the East African plateau are pastoralists
- Hausa of northern Nigeria are settled cultivators.
- The old grazing grounds of Masai tribes in the Kenyan Highlands were taken over by the immigrant white settlers for plantation agriculture (coffee, tea, cotton) and dairy farming.

- The cattle kept by the Masai are kept entirely for the supply of milk. They don't slaughter cattle for meat. Agriculture is barely practiced.
- The Hausa are a tribe of settled cultivators who inhabit the savanna lands of the Nigeria. They are more advanced in their civilization.
- They do not practice shifting cultivation. Instead, they clear a piece of land and use it for several years.

# Crops in Savanna

- savannas have immense agricultural potential for plantation agriculture of cotton, cane sugar, coffee, oil palm, groundnuts and even tropical fruits.
- In West Africa, the commercial cultivation of groundnuts, oil palm and cocoa have been gradually extended into the savanna lands.
- In the cooler highlands, temperate crops have been successfully raised.



# Cattle rearing

- The savanna is said to be the natural cattle country and many of the native people are pastoralists.
- But the quality of grass doesn't support large scale ranching.
- Grasses here are no match to nutritious and soft grasses of temperate grasslands.

- The cattle varieties are also poor and yield little meat or milk.
- The export of either beef or milk from the tropical grasslands is so far not important.
- Few regions progressed with the adaptation of science and technology.
- Queensland has become Australia's largest cattle producing state. Both meat and milk are exported.

# Desert Climate

- Deserts are regions where evaporation exceeds precipitation.
- There are mainly two types – hot like the hot deserts of the Saharan type and temperate as are the mid-latitude deserts like the Gobi.

# Hot Desert

- They include the biggest Sahara Desert (3.5 million square miles), Great Australian Desert, Arabian Desert, Iranian Desert, Thar Desert, Kalahari and Namib Deserts.
- In North America, the desert extends from Mexico into U.S.A. 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 (rain shadow effect and off-shore trade winds) is the driest of all deserts with less than 2 cm of rainfall annually.

# Mid-Latitude Desert

- The temperate deserts are rainless because of either continentality or rain-shadow effect.
- Gobi desert is formed due to continentality and Patagonian desert due to rain-shadow effect
- Amongst the mid-latitude deserts, many are found on plateau and are at a considerable distance from the sea.
- These are Ladakh, The Kyzyl Kum, Turkestan, Taklimakan and Gobi deserts of Central china

# Rainfall (Both Hot and Cold deserts)

- Deserts, whether hot or mid-latitude have an annual precipitation of less than 25 cm.
- Atacama (driest place on earth) has practically no rain at all.
- Rain normally occurs as violent thunderstorms of the convectional type.
- It 'bursts' suddenly and pours continuously for a few hours over small areas.
- The thunderstorm is so violent, and comes so suddenly that it has disastrous consequences on desert landforms [flash floods].

# Temperature of Hot deserts

- There is no cold season in the hot deserts and the average summer temperature is high around 30°C.
- The highest temperature recorded is 57.77° C in 1922 at A1 Azizia, Libya.
- The reasons for the high temperatures are obvious—a clear, cloudless sky, intense insolation, dry air and a rapid rate of evaporation.
- Coastal deserts by virtue of their maritime influence and the cooling effect of the cold currents have much lower temperatures.

- The diurnal range of temperature in the deserts is very great. Intense insolation by day in a region of dry air and no clouds causes the temperature to rise with the sun.
- But as soon as the sun sets, the land loses heat very quickly by radiation and the mercury levels drop.
- High diurnal temperature range is a typical feature of hot deserts

# Desert Vegetation

- The predominant vegetation of both hot and mid-latitude deserts is xerophytic or drought-resistant.
- This includes the cacti, thorny bushes, long-rooted wiry grasses and scattered dwarf acacias.
- Trees are rare except where there is abundant ground water to support clusters of date palms.
- Along the western coastal deserts washed by cold currents as in the Atacama Desert, support a thin cover of vegetation

- Intense evaporation increases the salinity of the soil so that the dissolved salts tend to accumulate on the surface forming hard pans [Bajada, Palaya].
- Absence of moisture retards the rate of decomposition and desert soils are very deficient in humus.
- Most desert shrubs have long roots and are well spaced out to gather moisture, and search for ground water.
- Plants have few or no leaves and the foliage is either waxy, leathery, hairy or needle-shaped to reduce the loss of water through transpiration.
- The seeds of many species of grasses and herbs have thick, tough skins to protect them while they lie dormant.

# The mining settlers

- It was gold that brought immigrants scrambling into the Great Australian Desert.
- In the Kalahari Desert, the discovery of diamonds and copper has brought many white men
- Similarly in the deserts of North America, silver is mined in Mexico, uranium in Utah and copper in Nevada.
- Saudi Arabia, Iran, Iraq, Kuwait, Algeria, Libya, Lebanon, Nigeria etc. are important oil producing desert countries.

# Steppe Climate or Temperate Continental Climate or Temperate Grassland Climate

- They lie in the interiors of the continents.
- Lie in the Westerly wind belt [mid latitudes or temperate region].
- Grasslands are practically treeless due to continentality
- In Eurasia, they are called the Steppes, and stretch eastwards from the shores of the Black Sea to the foothills of the Altai Mountains

## Name of the Temperate Grassland Region

- Pustaz:- Hungary and surrounding regions
- Prairies:- North America [between the foothills of the Rockies and the Great Lakes]
- Pampas :-Argentina and Uruguay
- Bush-veld (more tropical) Northern South Africa

# Temperature

- Climate is continental with extremes of temperature.
- Temperatures vary greatly between summer and winter.
- The summers are hot and the winters are cold.
- Summers are very warm, over 18 – 20° C.
- The steppe type of climate in the southern hemisphere is never severe.

# Precipitation

- The average rainfall may be taken as about 45 cm, but this varies according to location from 25 cm to 75 cm.
- The heaviest rain comes in June and July (late spring and early summer).
- Most of the winter months have about an 2.5 cm of precipitation, brought by the occasional depressions of the Westerlies and coming in the form of snow.

# Natural Vegetation of Steppe Climate

## **Grasses**

- Greatest difference from the tropical savanna is that steppes are practically treeless and the grasses are much shorter.
- Grasses are tall, fresh and nutritious. This is typical of the grass of the wheat-lands in North America, the rich black earth or chernozem areas of Russian Ukraine and the better watered areas of the Asiatic Steppes.
- Where the rainfall is light or unreliable, or the soil is poor, as in the continental interiors of Asia the short steppe type of grass prevails.

- These areas are less suitable for arable farming and are used for some form of ranching as in the High Plains of U.S.A.

## Animals

- Does not have much animal diversity.
- Horses are common in Asian Steppes.

# Wheat and Maize Cultivation

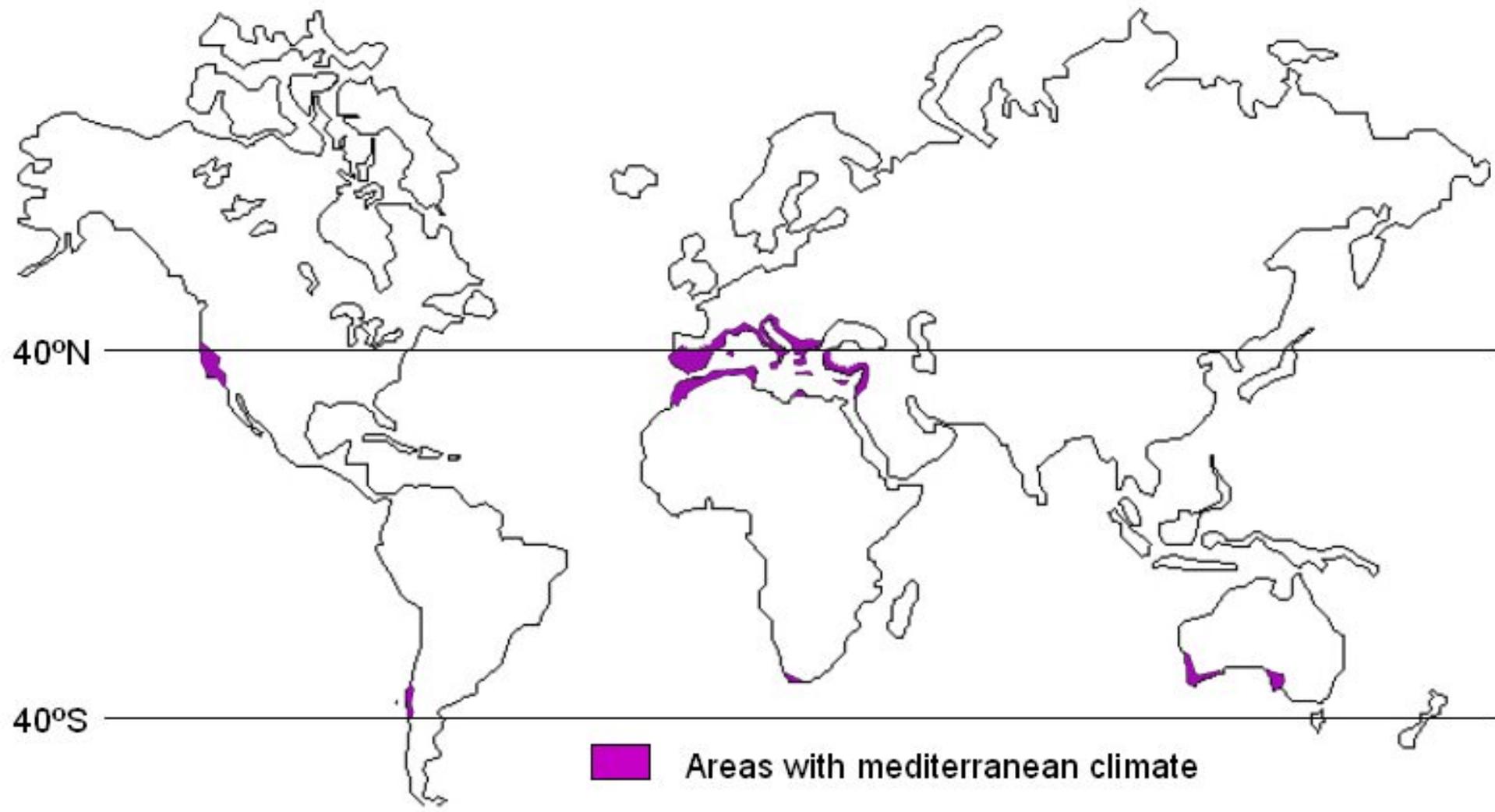
- Cultivation was unknown just before a century and the region was one of the most sparsely populated parts of the world.
- In recent years, the grasslands have been ploughed up for extensive, mechanized wheat cultivation and are now the 'granaries of the world' [Prairies].
- Besides wheat, maize is increasingly cultivated in the warmer and wetter areas.

## Ranching

- The tufted grasses have been replaced by the more nutritious Lucerne or alfalfa grass for cattle and sheep rearing.
- These temperate grasslands are now the leading ranching regions of the globe.

# Mediterranean Climate or Warm Temperate Western Margin Climate

- Entirely confined to the western portion of continental masses, between 30° and 45° north and south of the equator.
- The basic cause of this type of climate is the shifting of the wind belts.
- Mediterranean Sea has the greatest extent of this type of 'winter rain climate', and gives rise to the name Mediterranean Climate.
- The best developed form of this climatic type is found in central Chile.
- Other Mediterranean regions include
  - California (around San Francisco),
  - the south-western tip of Africa (around Cape Town),
  - southern Australia, and south-west Australia (Swanland).



# Mediterranean Climate

- Clear skies and high temperatures; hot, dry summers and cool, wet winters.
- Mean annual precipitation ranges from 35 to 90 cm.
- Temperature of warmest month greater than or equal to  $10^{\circ}$  C.
- Temperature of coldest month is less than  $18^{\circ}$  C but greater than  $-3^{\circ}$  C
- Climate is not extreme because of cooling from water bodies.

# A dry, warm summer with off-shore trades

- In summer when the sun is overhead at the Tropic of Cancer, the belt of influence of the Westerlies is shifted a little pole wards.
- Rain bearing winds are therefore not likely to reach the Mediterranean lands.
- The prevailing Trade Winds [tropical easterlies] are off-shore and there is practically no rain.
- Strong winds from inland desert regions pose the risk of wildfires.

# Rainfall in winter with on-shore Westerlies

- The Mediterranean lands receive most of their precipitation in winter when the Westerlies shift equator wards.
- In the northern hemisphere, the prevailing on-shore Westerlies bring much cyclonic rain from the Atlantic (Typical to Mediterranean Climate).
- The rain comes in heavy showers and only on a few days with bright sunny periods between them.
- This is another characteristic feature of the Mediterranean winter rain.
- Though the downpours are infrequent they are often very torrential and in mountainous districts, destructive floods occur.

# Natural Vegetation in the Mediterranean Climate

- Trees with small broad leaves are widely spaced and never very tall.
- The absence of shade is a distinct feature of Mediterranean lands.
- Plants are in a continuous struggle against heat, dry air, excessive evaporation and prolonged droughts.
- They are, in short xerophytic

## Grass

- Conditions in the Mediterranean do not suit grass, because most of the rain comes in the cool season when growth is slow.
- Even if grasses do survive, they are so wiry [lean, tough] and bunchy that they are not suitable for animal farming.
- Cattle rearing is thus unimportant in the Mediterranean.

# Orchard farming

- 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.
- The fruit trees have long roots to draw water from considerable depths during the long summer drought.
- The thick, leathery skin of the citrus fruits prevents excessive transpiration.

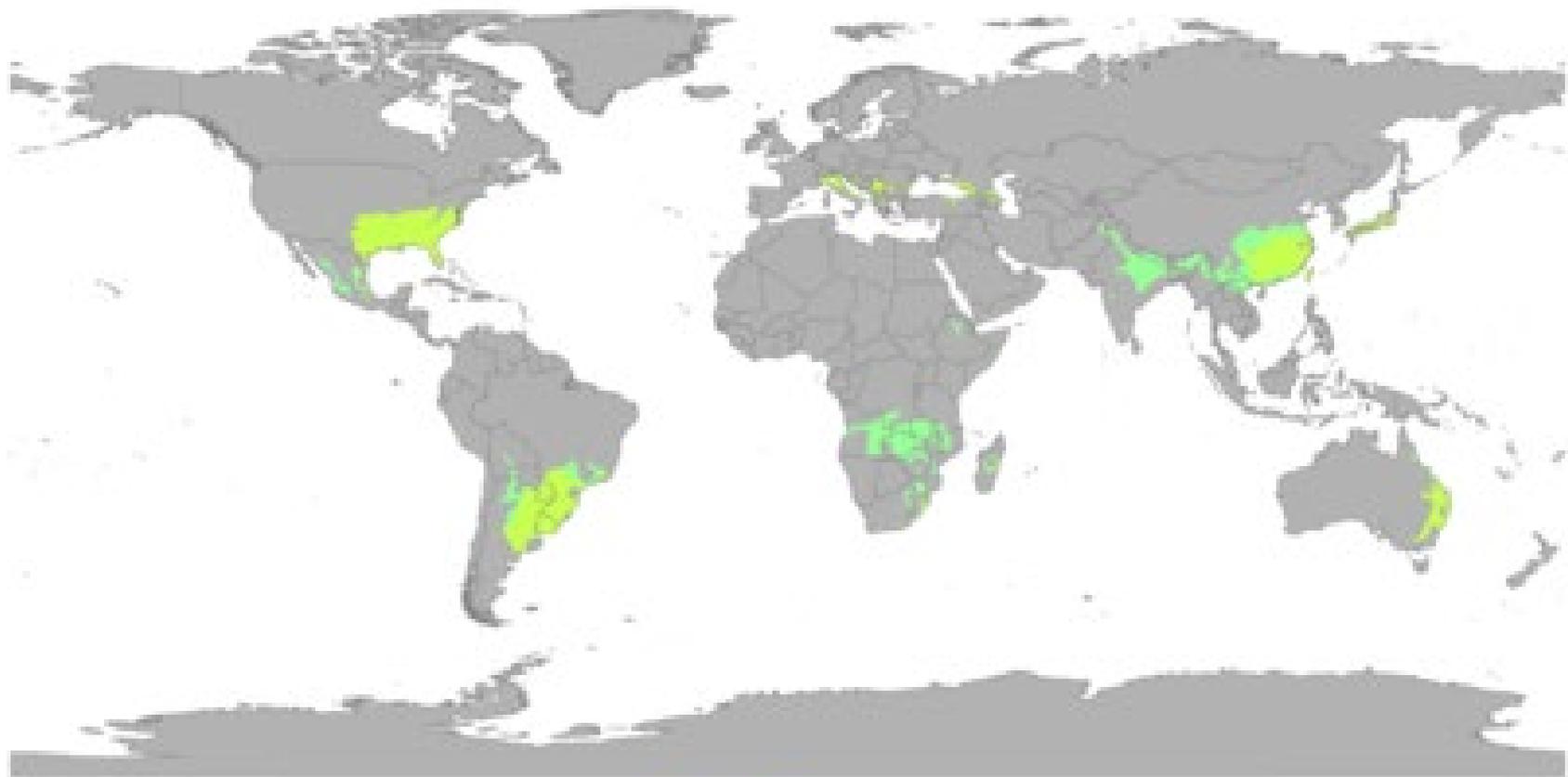
- The long, sunny summer enables the fruits to be ripened and harvested.
- The Mediterranean lands account for 70 per cent of the world's exports of citrus fruits.
- The olive tree is probably the most typical of all Mediterranean cultivated vegetation.
- Olive oil extracted is a valuable source of cooking oil in a region deficient in animal fat.

# Wine production

- Viticulture is by tradition a Mediterranean occupation.
- Regions bordering the Mediterranean Sea account for three-quarters of the world's production of wine.
- Some 85 per cent of grapes produced, go into wine.
- The long, sunny summer allows the grapes to ripen.

# Warm Temperate Eastern Margin Climate

- Different variants of Warm Temperate Eastern Margin Climate include the
- Temperate monsoon Climate or China Type Climate,
- Gulf Type Climate and
- Natal Type Climate.
- Found between 20° and 35° N and S latitude (warm temperate latitudes just outside the tropics); on the east coast in both hemispheres.



Al	BWh	Csa	Cwa	Cfa	Dsa	Dwa	Dfa	ET
Am	BWk	Csb	Cwb	Cfb	Dsb	Dwb	Dfb	EF
Aw	BSh	Csc	Cfc	Dsc	Dwc	Dfc		
	BSk			Dsd	Dwd	Dfd		

## China Type

- Temperate Monsoon or China Type climate is observed in most parts of China.
- The climate is also observed in southern parts of Japan.

## Gulf Type

- Found in south-eastern U.S.A., bordering the Gulf of Mexico where continental heating in summer induces an inflow of air from the cooler Atlantic Ocean.

- Natal Type
- Found in in New South Wales (Australia), Natal (South Africa), Parana-Paraguay Uruguay basin (South America).
- Natal type is different from temperate monsoon or China type as it receives rainfall from on-shore Trade Winds all the year round

# Climate

- Characterized by a warm moist summer and a cool, dry winter (one exception: winters are also moist in Natal Type).

# Temperature

- The mean monthly temperature varies between 4° C and 25° C and is strongly modified by maritime influence.
- Occasionally, the penetration of cold air (Polar Vortex) from the continental interiors may bring down the temperature to freezing point.
- Though frosts are rare they occasionally occur in the colder interiors

# Precipitation

- Rainfall is more than moderate, anything from 60 cm to 150 cm.
- This is adequate for all agricultural purposes and hence supports a wide range of crops.
- Areas which experience this climate are very densely populated.
- There is the fairly uniform distribution of rainfall throughout the year

- In summer, the regions are under the influence of moist, maritime airflow from the subtropical anticyclonic cells.
- Local storms, e.g. typhoons (tropical cyclones), and hurricanes, also occur

# The China type

- Summer
- Intense heating within interiors (Tibet, desert region) sets up a region of low pressure in summer attracting tropical Pacific air stream (South-East Monsoon).
- Monsoon does not 'burst' as suddenly, nor 'pour' as heavily as in India.
- Typhoons form mostly in late summer, from July to September.

# Winter

- In winter, there is intense pressure over Siberia and the continental polar air stream flows outwards as the North-West Monsoon, bitterly cold and very dry.
- There is little rain but considerable snow on the windward slopes.
- Another climatic feature associated with the China type of climate in southern China is the occurrence of typhoons.

# The Gulf type

- Monsoonal characteristics are less intense compared to China type.
- There is no complete seasonal wind reversal.
- Hurricanes occur in September and October.

# The Natal type

- The narrowness of the continents and the dominance of maritime influence eliminate the monsoonal elements.
- The South-East Trade Winds bring about a more even distribution of rainfall throughout the year

# Natural Vegetation

- Supports a luxuriant vegetation.
- The lowlands carry both evergreen broad leaved forests and deciduous trees [hardwood]
- On the highlands, are various species of conifers such as pines and cypresses which are important softwoods.
- Perennial plant growth is not checked by either a dry season or a cold season.



# Agriculture in the Gulf states

- The humid air, the sunny summer and the heavy showers suit the crop well.
- It is grown right from the Gulf coast to the Mid-west south of the Great Lakes, with the greatest concentration in the Corn Belt of Nebraska, Iowa, Indiana and Ohio.
- The region accounts for more than half the world's production of corn, but only 3 per cent of the world's export.
- This is because most of the corn is used for fattening animals, mostly cattle and pigs. [Thriving beef and pork industry]

- The fattened animals are then sold to the meat plants in Chicago and Cincinnati to be processed into 'corned beef'. [From here the beef is exported through Great Lakes and St Lawrence water way]
- Apart from its ease of cultivation, corn's most outstanding feature is its prolific yield.
- It gives almost twice as much food (mainly starch) per acre as wheat or other cereals.
- This explains why it is so widely cultivated in both the warm temperate and the tropical latitudes

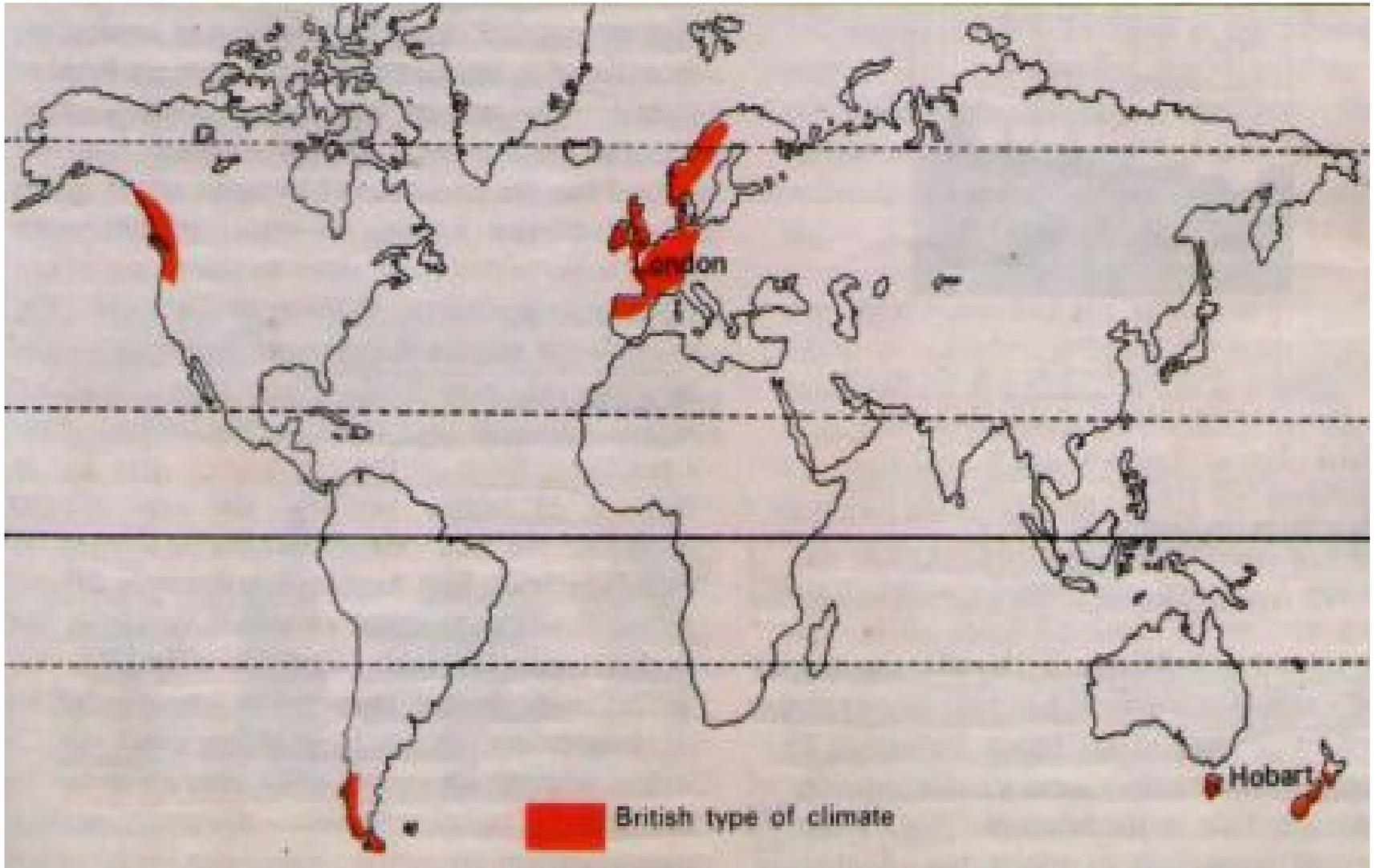
# Tobacco

Native crop of America.

- Virginia tobacco is famous.
- The humid atmosphere, the warmth and the well-drained soils of the Gulf states, enable tobacco to be successfully cultivated in many of the eastern states of U.S.A.
- No less than half the tobacco that enters international trade comes from these states.

# British Type Climate

- Westerlies come all the year round.
- There is a tendency towards an autumn or winter maximum of rainfall.
- Light snow falls in winter.
- Ports are never frozen but frosts do occur on cold nights
- The seasons are very distinct .
- And the climate is very favorable for maximum human output.



# Distribution of British Type Climate

## Europe

- Most pronounced in and around Britain.
- In Europe the climate extends inland some 2,000 km.
- Climatic belt stretches far inland into the lowlands of North-West Europe (northern and western France, Belgium, the Netherlands, Denmark, western Norway and also north-western Iberia).

## North America

- Confined mainly to the coastlands of British Columbia. [high Rockies prevent the on-shore Westerlies from penetrating far inland]

## Southern Hemisphere

- The climate is experienced in southern Chile, Southern Australia, Tasmania and most parts of New Zealand.

# Climate

- Moderately warm summers and fairly mild winters.
- Rainfall occurs throughout the year with winter maximum

# Temperature

- The mean annual temperatures are usually between 5° C and 15° C.
- Winters are abnormally mild. This is because of the warming effect brought by warm North Atlantic Drift.
- Sometimes, unusual cold spells are caused by the invasion of cold polar continental air (Polar Vortex) from the interiors.

# Precipitation

- The British type of climate has adequate rainfall throughout the year with a tendency towards a slight winter maximum (due to frontal cyclones).
- Western margins have the heaviest rainfall due to westerlies.
- Relief can make great differences in the annual amount. This is particularly significant in New Zealand where the western margins are subjected to heavy orographic rainfall whereas the eastern
- Canterbury plains receive comparatively less rainfall due to rain-shadow effect.

# The seasons

- As in other temperate regions there are four distinct seasons.
- Winter is the season of cloudy skies, foggy and misty mornings, and many rainy days from the passing depressions.
- Spring is the driest and the most refreshing season when people emerge from the depressing winter to see everything becoming green again.

- This is followed by the long, sunny summer.
- Next is the autumn with the roar of gusty winds; and the cycle repeats itself.

# Natural Vegetation in British Type Climate

- The natural vegetation of this climatic type is deciduous forest.
- The trees shed their leaves in the cold season.
- This is an adaptation for protecting themselves against the winter snow and frost.
- Shedding begins in autumn, the 'fall' season.
- Some of the common species include oak, elm, ash, birch, beech, and poplar.

# Lumbering is quite profitable

- Unlike the equatorial forests, the deciduous trees occur in pure stands and have greater lumbering value.
- The open nature of the forests with sparse undergrowth is useful in logging operations.
- Easy penetration means much cost can be saved in the movement of the logs.
- The deciduous hardwoods are excellent for both fuel and industrial purposes.
- In Tasmania, the temperate eucalypts are also extensively felled for the lumbering industry.
- Higher up the mountains, conifers (softwood) are felled and transported to paper and pulp industry. They are extensively used in cardboard making.

# Industrialization

- The regions are highly industrialized with high standard of living.
- The countries are concerned in the production of machinery, chemicals, textiles and other manufactured articles rather than agriculture, fishing or lumbering, though these activities are well represented in some of the countries.
- Fishing is particularly important in Britain, Norway and British Columbia.
- Britain, France and Germany have significant mineral resources and are heavily industrialized.

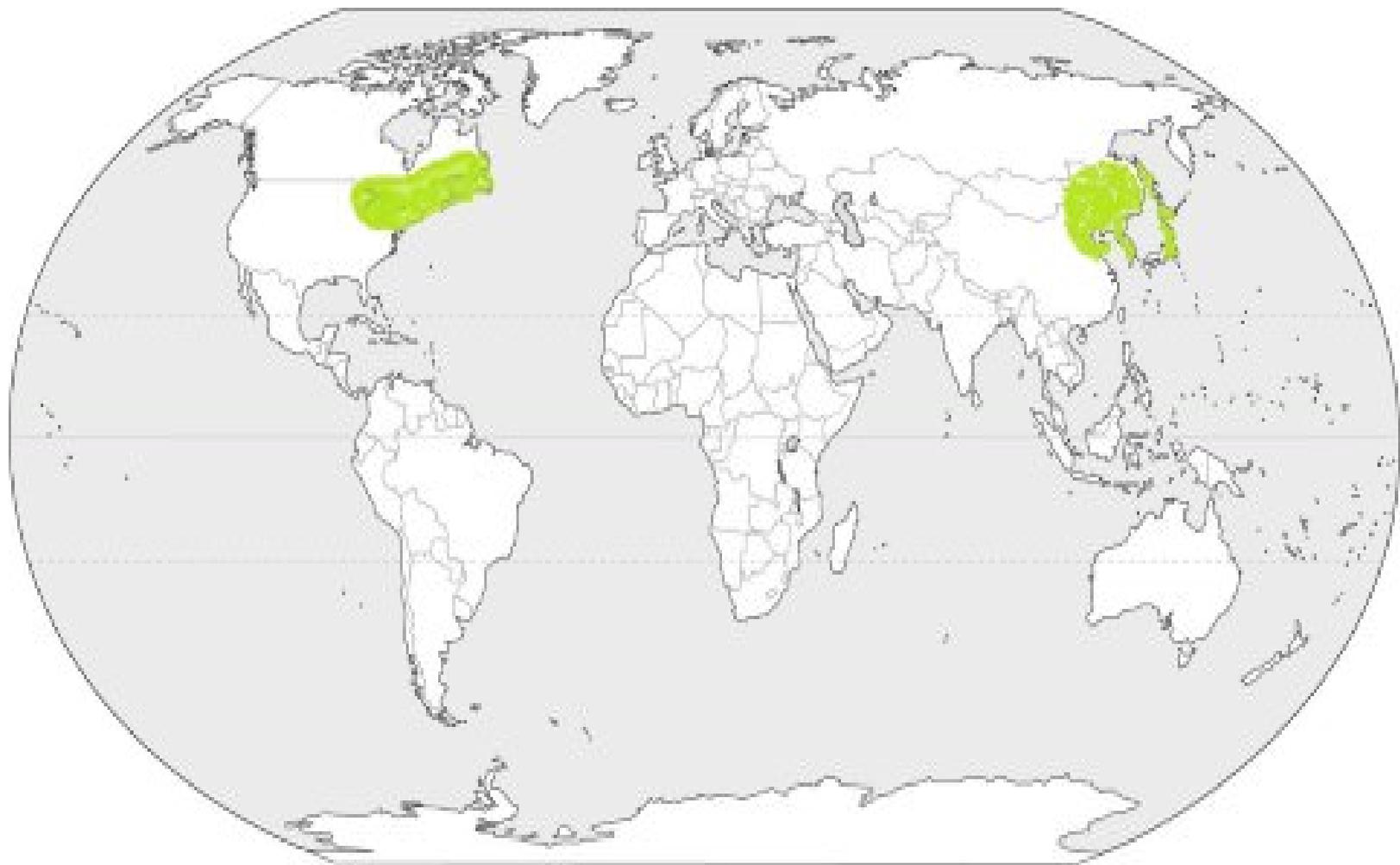
- Ruhr region in Germany, Yorkshire, Manchester and Liverpool regions in Britain are significant for wide ranging manufacturing industries.
- Automobile industry is the most significant. (BMW, Volkswagen, Audi, Mercedes-Benz and many other world leading car manufacturers have their headquarters in Germany).
- Industries based on dairy products thrive in Denmark, Netherlands and New Zealand.

# Agriculture

- A large range of cereals, fruits and root crops are raised, mainly for home consumption rather than for export.
- North-West Europe, which includes some of the most crowded parts of the globe, has little surplus for export.
- It is, in fact, a net importer of food crops, especially wheat.

# Laurentian Climate or Cool Temperate Eastern Marine Climate

- Intermediate type of climate between the British Type Climate (moderate) and the Taiga Type Climate (extreme) of climate.
- It has features of both the maritime and the continental climates.



# Distribution of Laurentian Climate

- North-eastern North America, including eastern Canada, north-east U.S.A., and Newfoundland. This may be referred to as the North American region.
- Eastern coastlands of Asia, including eastern Siberia, North China, Manchuria, Korea and northern Japan.

# Absent in Southern Hemisphere

- In the southern hemisphere only a small section of continents extends south of 40°S latitude.
- Some of these small sections come under the rain-shadow region of Andes (Patagonia) and hence Westerlies hardly ever reach these regions.
- So these regions are subjected to aridity rather than continentality.
- In other regions, the oceanic influence is so profound that neither the continental nor the eastern margin type of climate exists.

# Temperature

- Characterized by cold, dry winters and warm, wet summers.
- Winter temperatures is below freezing point and snow fall is quite natural.
- Summers are as warm as the tropics ( $\sim 25$  °C).

# Precipitation

- Rainfall occurs throughout the year with summer maxima [easterly winds from the oceans bring rains]
- Annual rainfall ranges from 75 to 150 cm [two – thirds of rainfall occurs in the summer].
- Dry Westerlies that blow from continental interiors dominate winters.

# Natural Vegetation

- The predominant vegetation is cool temperate forest.
- The heavy rainfall, the warm summers and the damp air from fogs, all favor the growth of trees.
- Forest tend to be coniferous north of the 50°N latitude.
- In the Asiatic region (eastern Siberia and Korea)the coniferous forests are a continuation of the great coniferous belt of the taiga.

# Lumbering

- Timber and fish are the leading export items.
- Much of the coniferous forests of fir, spruce and larch are exploited to a great extent.
- Eastern Canada is the heart of the Canadian timber and wood pulp industry [St. Lawrence River helps in export].
- South of latitude  $50^{\circ}\text{N}$ ., the coniferous forests give way to deciduous forests.
- Oak, beech, maple and birch are most common.

- Almost homogeneous species of trees [pure stands], and the predominance of only a handful of species greatly enhance the commercial value of these forests.
- They have been extensively felled for the extraction of temperate hardwood. [From Laurentian Climate regions, both temperate hardwood and temperate softwood are obtained]
- In Manchuria, Korea and Japan, the forests have made way for the agriculture.

# Economic Development

- Lumbering and its associated timber, paper and pulp industries are the most important economic undertaking.
- Agriculture is less important because of long and severe winters.
- In the North American region, farmers are engaged in dairy farming.
- The Annapolis valley in Nova Scotia is the world's most renowned region for apples.
- Fishing is, however, the most outstanding economic activity.

# Fishing off Newfoundland

- Regions around the Grand Banks of Newfoundland are the world's largest fishing grounds.
- Mixing of warm Gulf Stream and cold Labrador currents make the region the most productive fishing ground on earth.
- The gently sloping continental shelves stretch for over 200 miles south-east of Newfoundland, and off the coasts of the Maritime Provinces and New England.
- Hence microscopic plankton are abundant [Continental Shelf + Mixing of Warm and Cold Ocean Currents].

- Fish of all types and sizes feed and breed here and support a thriving fishing industry.
- Along with Canada and U.S.A., countries like Norway, France, Britain, Portugal, Denmark, Russia and Japan, also send fishing fleets to the Grand Banks.
- In Newfoundland, fishing provides employment for almost the entire population.
- Further inland, in lakes and rivers, such as the St. Lawrence and the Great Lakes, freshwater fish, e.g. salmon etc. are caught.

- All the fishing activities are carried out by highly mechanized trawlers which can store fish in refrigerated chambers for months.
- St. John's, chief port of Newfoundland is the headquarters of the Grand Banks fishing industries.
- All processing activities like cutting, cleaning, packing for disposal are done at the ports itself.
- Over-fishing is a growing problem.

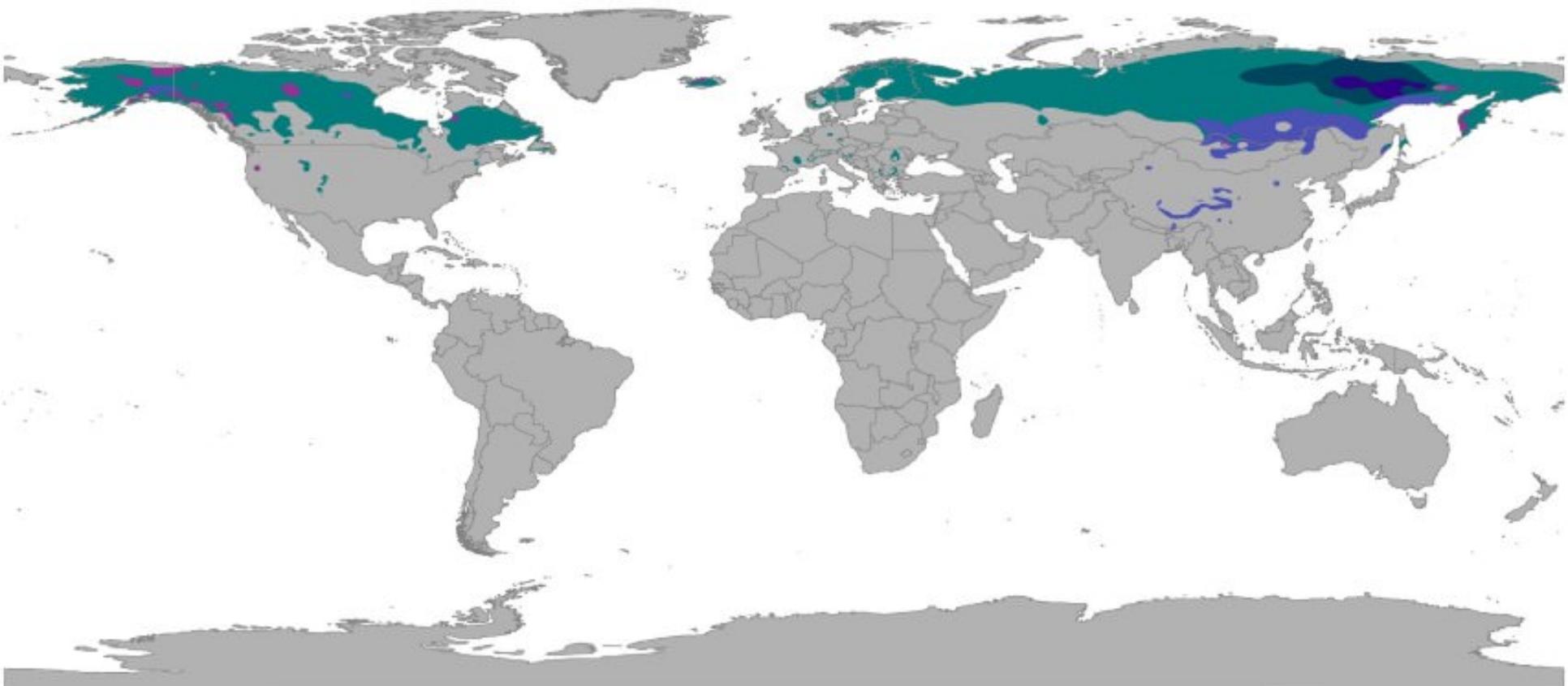
# Fishing off Japan

- North-west Pacific surrounding the islands of Japan is another very important fishing grounds of the world.
- Majority of the people in the region depend on fishing for survival.
- Hakodate and Kushiro are large fishing ports with complete refrigeration facilities.
- The Japanese fishing trawlers venture far and wide into the Arctic, Antarctic and the Atlantic waters.

- Large whaling fleets with processing plants venture into distant regions as far as Arctic and Antarctic
- Japan is criticized for its whaling operations.
- Japan accounts for a sixth of the world's total annual fish caught.
- The Japanese make use of fish wastes, fish meal and seaweeds as fertilizers in their farms.

# Taiga Climate

- Found only in the northern hemisphere
- due to great east-west extent. Absent in the southern hemisphere because of the narrowness in the high latitudes.
- Experienced in the regions just below Arctic circle.
- On its poleward side, it merges into the Arctic tundra.
- The climate fades into the temperate Steppe climate.



Af	BWh	Csa	Cwa	Cfa	Dsa	Dwa	Dfa	ET
Am	BWk	Csb	Cwb	Cfb	Dsb	Dwb	Dfb	EF
Aw	BSh		Cwc	Cfc	Dsc	Dwc	Dfc	
	BSk				Dsd	Dwd	Dfd	

# Temperature

- Summers are brief and warm reaching 20-25 °C whereas winters are long and brutally cold – always 30-40 °C below freezing.
- Annual temperature range of the Siberian Climate is the greatest Almost 50-60 °C in Siberia.
- Some of the lowest temperatures in the world are recorded in Verkhoyansk (68°N. 113°E) where -67 °C was once recorded.

- All over Russia, nearly all the rivers are frozen. In normal years, the Volga is ice covered for about 150 days.
- Occasionally cold, northerly polar local winds such as the blizzards of Canada and buran of Eurasia blow violently.

# Precipitation

- Maritime influence in the interiors is absent.
- Frontal disturbances might occur in winter.
- Typical annual precipitation ranges from 38 cm to 63 cm.
- It is quite well distributed throughout the year, with a summer maximum (convictional rain in mid-summer – 15 °C to 24 °C)
- In winter the precipitation is in the form of snow, as mean temperature is below freezing point.

# Natural Vegetation

- The predominant vegetation is evergreen coniferous forest.
- The conifers, which require little moisture are best suited to this type of sub-Arctic climate.
- The greatest single band of the coniferous forest is the taiga (a Russian word for coniferous forest) in Siberia.
- In Europe the countries that have a similar type of climate and forests are Sweden and Finland.

- There are small amounts of natural coniferous forest in Germany, Poland, Switzerland, Austria and other parts of Europe.
- In North America, the belt stretches from Alaska across Canada into Labrador.

# Softwood trees

- The coniferous forest belts of Eurasia and North America are the richest sources of softwood.
- Softwood is used in building construction, furniture, matches, paper and pulp, rayon and other branches of the chemical industry.
- The world's greatest softwood producers are Russia, U.S.A., Canada and the Fenoscandian countries (Finland, Norway and Sweden).

- In the production of wood pulp (by both chemical and mechanical methods), the U.S.A. is the leader.
- But in the field of newsprint, Canada accounts for almost half of the world's total annual production.
- There are four major species in the coniferous forests – Pine, Fir, e.g. Douglas fir and balsam fir; Spruce and Larch.
- Their presence in pure stands and the existence of only a few species are a great advantage in commercial forest exploitation.

# Economic Development

- Lot of coniferous forests in the northern hemisphere are still untouched due to remoteness.
- Only a small fraction of coniferous forests in Canada, Russia etc. are exploited leaving a huge potential for the future.
- More accessible forests are cleared for lumbering on a large scale.
- Agriculture is most unlikely as few crops can survive in the sub-Arctic climates

# Trapping

- Many fur-bearing animals are trapped in northerly lands of Canada and Eurasia.
- Wherever the cold is severe, the quality and thickness of the fur increases.
- The most severe winters produce the finest furs.
- In Canada trappers and hunters, armed with automatic rifles, reside in log cabins in the midst of the coniferous forests to track down these animals

- Muskrat, ermine, mink, and silver fox are the most important fur-bearing animals.
- To ensure a more regular supply of furs many fur farms have been established in Canada and Siberi

# Lumbering

- This is the most important occupation of the Siberian type of climate.
- The vast reserves of coniferous forests provide the basis for the lumbering industry.
- Lumberjacks: Contract laborers called lumber jacks used to temporarily move to the forest regions to fell the trees. Now felling is done by machines.
- Rivers for transportation: The soft wood logs easily float on rivers. Hence rivers are used to transport logs to the sawmills located down the stream.

- Sawmilling: Logs are processed in saw mills into timber, plywood, and other constructional woods.
- Paper and pulp industry: Timber is pulped by both chemical and mechanical means to make wood pulp. wood pulp is the raw material for paper-making and newsprint.
- Canada and U.S.A. are leading suppliers of newsprint and wood pulp respectively.
- As a fuel: Very little softwood is burnt as fuel as its industrial uses are far more significant.
- As an industrial raw material: In Sweden, matches form a major export item.
- From other temperate countries, timber is used for making furniture, wood- carvings, toys, packing cases etc..

# Tundra Climate

- Found in regions north of the Arctic Circle and south of Antarctic Circle.
- The ice-caps are confined to highlands and high latitude regions of Greenland and Antarctica.
- In the southern hemisphere, Antarctica is the greatest single stretch of ice-cap (10,000 feet thick)
- The lowlands – coastal strip of Greenland, the barren grounds of northern Canada and Alaska and the Arctic seaboard of Eurasia, have tundra climate.



# Temperature

- The tundra climate is characterized by a very low mean annual temperature.
- In mid-winter temperatures are as low as 40 – 50 °C below freezing.
- Normally not more than four months have temperatures above freezing-point.
- Within the Arctic and Antarctic Circles, there are weeks of continuous darkness due to Rotation and Revolution

# Precipitation

- Precipitation is mainly in the form of snow and sleet.
- Convictional rainfall is generally absent.

# Natural Vegetation

- There are no trees in the tundra.
- Lowest form of vegetation like mosses, lichens etc. are found here and there.
- Climatic conditions along the coastal lowlands are a little favorable.
- Coastal lowlands support hardy grasses and the reindeer moss which provide the only pasturage for reindeers.

- In the brief summer, berry-bearing bushes and Arctic flowers bloom.
- In the summer, birds migrate north to prey on the numerous insects which emerge when the snow thaws.
- Mammals like the wolves, foxes, musk-ox, Arctic hare and lemmings also live in tundra regions.
- Penguins live only in Antarctic regions.

# Human Activities

- Human activities of the tundra are largely confined to the coast.
- People live a semi-nomadic life.
- In Greenland, northern Canada and Alaska live the Eskimos.
- During winter they live in compact igloos.
- Their food is derived from fish, seals, walruses and polar bears.
- Now a days rifles instead of traditional harpoons are used to track down animals.