

2018

INTEGRATED LEARNING PROGRAMME, ILP

IASBABA



[GEOGRAPHY-WORLD CLIMATE]

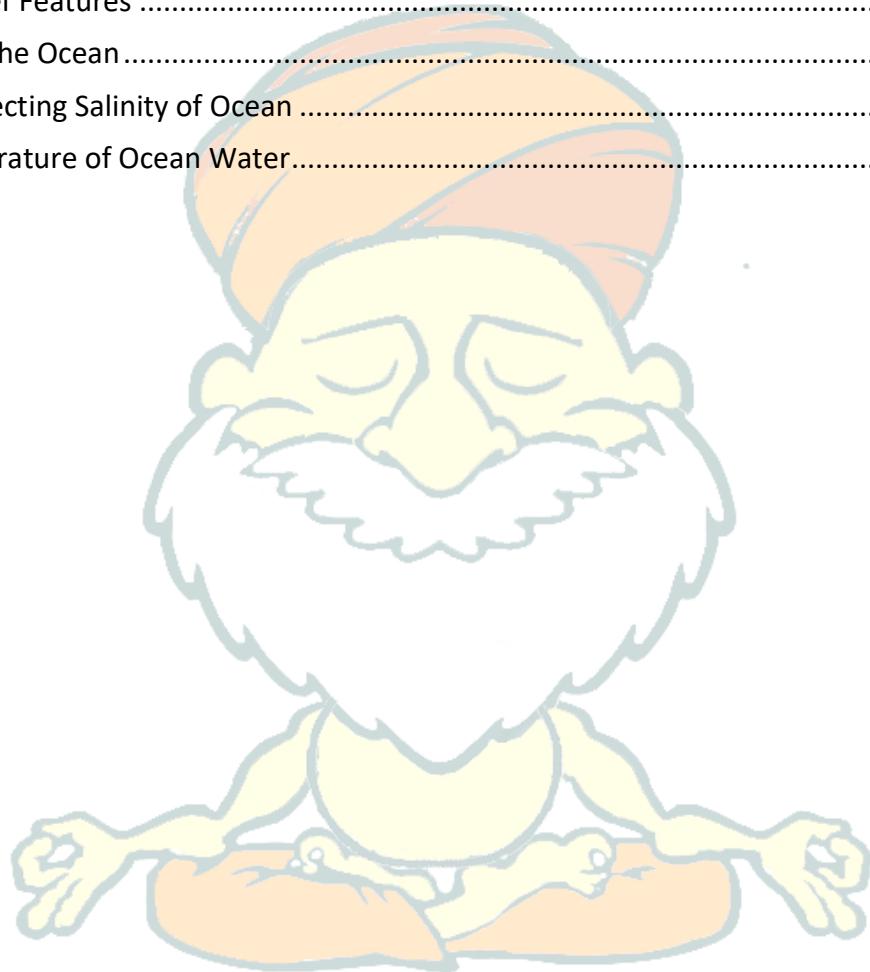
Integrated Learning Programme 2018 is a step towards 'Enabling a person located at the most remote destination a chance at cracking AIR 1 in UPSC/IAS'

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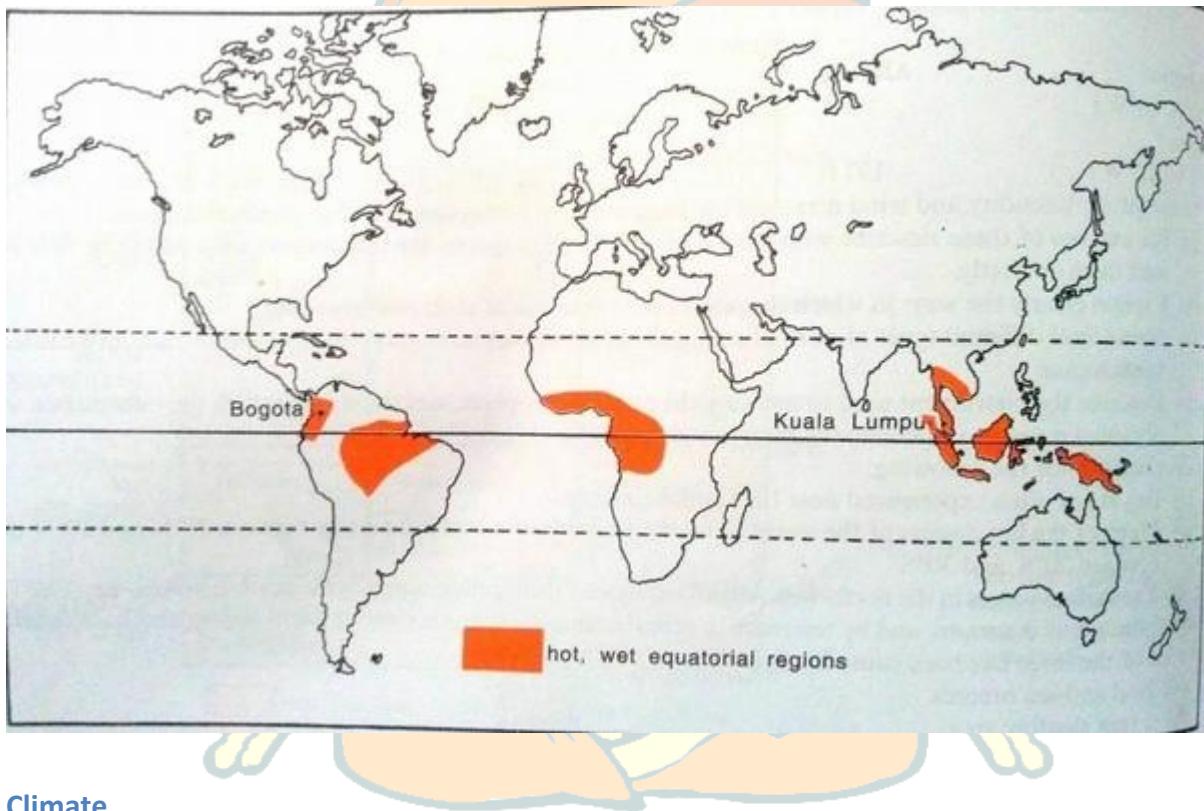
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THE HOT, WET EQUATORIAL CLIMATE

Distribution

- Found between - 5° and 10° N and S of equator
- Greatest extent – Amazon lowlands, Congo, Malaysia and East Indies
- Away from equator, a modified type of equatorial climate with monsoonal influences developed because of shore trade winds.
- Within tropics - the equatorial highlands have a distinctively cooler climate because of altitude. E.g. **Cameron Highlands in Malaysia, the Northern Andes, and the Kenyan Highlands in East Africa.**



Climate

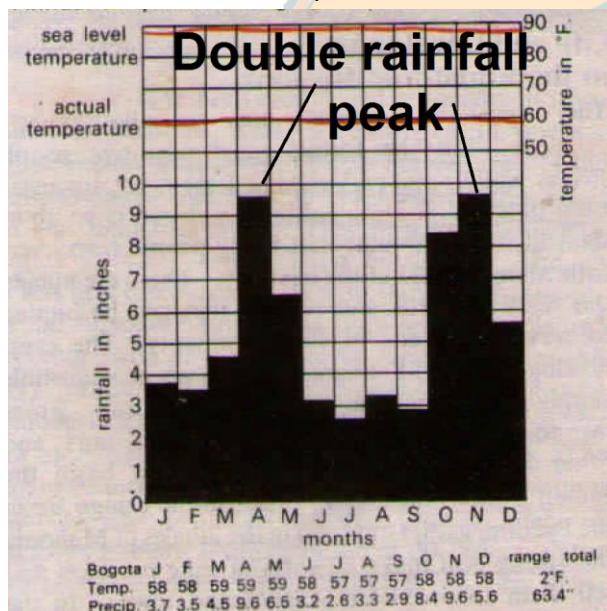
Temperature

- Uniformity of temperature throughout year
- Mean monthly temperature: 26° – 28° C with very little variation
- No winter
- **Moderation of temperature because of –**
 - Cloudiness
 - Heavy precipitation

- Land and sea breezes
- **Diurnal range of temperature – small**
- **Annual range of temperature – small**

Precipitation

- Heavy rainfall (200 cm and above)
- Well distributed throughout year
- Rainfall in every month
- No dry season
- Double rainfall peak –
 - Only feature (no other climate has)
 - Coincide with equinoxes



- Sometimes it is upset by local conditions
- Mornings – bright and sunny (because great heat)
- High evaporation and convectional air currents
- Convectional rain with cumulonimbus clouds
- **Torrential shower** - Torrential rain or a torrential downpour, is any amount of rain that is considered especially heavy. It is accompanied by lightning and thunder. It is so much that desert receive this much in a year
- Orographic or relief rain – in mountains
- Relative Humidity – high (80%)

Vegetation



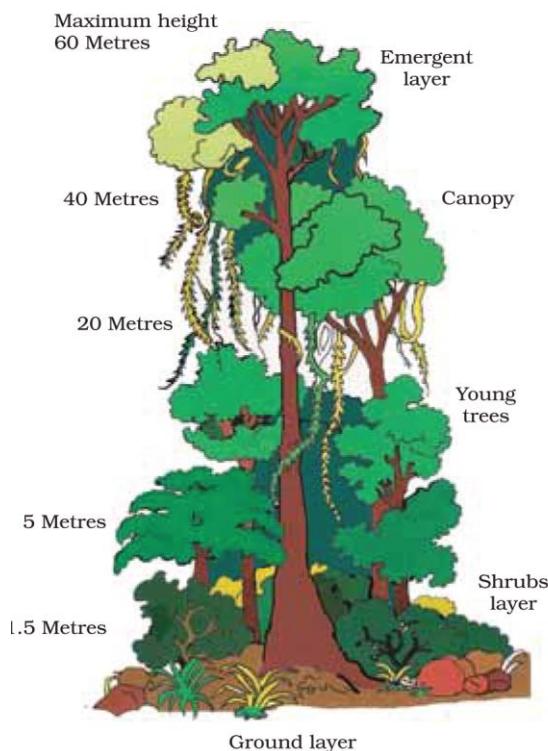
- Tropical rain forest because of high rainfall and temperature.
- Amazon lowlands (very dense forest) called '**Selvas'**.
- Growing season all-rounder like Jacque Kallis ☺ (seeding, flowering, fruiting and decaying)
- No drought and cold

Characteristic features

Variety of vegetation

- Multitudes of **evergreen trees** – mahogany, ebony, mangrove, greenheart, cabinet woods and dyewoods.
- Smaller palm trees
- Climbing plants - lianas or rattan
- Epiphytic or parasitic plant (live on others)

Distinct stratification



- The top layer is captured by long trees which makes thick canopy. It is so much thick that the plants which grow on surface didn't get enough sunlight.
- The next layer – smaller trees
- Ground - ferns and herbaceous plants

Multiple species

- Not just few species like temperate
- More than 200 species of tree

Forest clearings

- Forests have been cleared for lumbering or shifting cultivation
- Coastal areas and brackish swamps have mangrove forest

Life and development in the equatorial regions

- Sparsely populated.
- Hunters and collectors live in forest.
- Shifting cultivation is practiced
- Food availability – abundant
 - Rivers and streams provide fishes

- Forest – fruits, nuts and other forest products
- Crops – manioc, yams, maize, bananas and groundnuts
- Plantation established in Java, Sumatra, Malaysia, west Africa and central America after coming of Europeans
- Favorable climate for west lover crops which are grown here – Natural Rubber, Cocoa and Oil palm
- **Natural Rubber**- Malaysia, Indonesia and Thailand- leading producers. Currently Thailand is the leading producer in the World followed by Indonesia.



Cocoa Plant

- Cocoa is also in great demand by North America and Europe for chocolate production. Mostly cultivated in western Africa. Nigeria and Ghana one of the largest exporters.
- Other crops – oil pam, coconuts, sugarcane, coffee, tea, tobacco, spices, cinchona, bananas, pineapples and sage.

Factors Affecting the Development of Equatorial Regions

Equatorial climate and health

- Because of excessive heat and high humidity, body sweats lot and loses vigor and energy
- Danger of sunstroke, malaria and yellow-fever.

- This leads to decrease in working capacity and immunity of body.

Prevalence of bacteria and insect pests

- We have read that excessive humidity helps in promoting growth of germs.
- Germs and bacteria transmit easily through moist air.
- Equatorial conditions are ideal for the survival of such organisms.
- Insects and pests' spread diseases as well as injure crops.
- They plague both men and animals.

Jungle hinders development and maintenance

- It is not easy to clear and maintain these jungles
- To do any kind of developmental work or even for farming first forests have to be cleared which is not easy task as the growth rate of them is very high
- And even if they are cleared then there are dangerous animals, snakes and many more dangers
- After construction they need to be maintained as lalang and thick undergrowth cover them again and so it's very costly to do and maintain such tedious job.
- Many remote parts of the Amazon basin, the Congo and Borneo are without modern communication lines. The rivers form the only natural highways.

Rapid deterioration of tropical soil

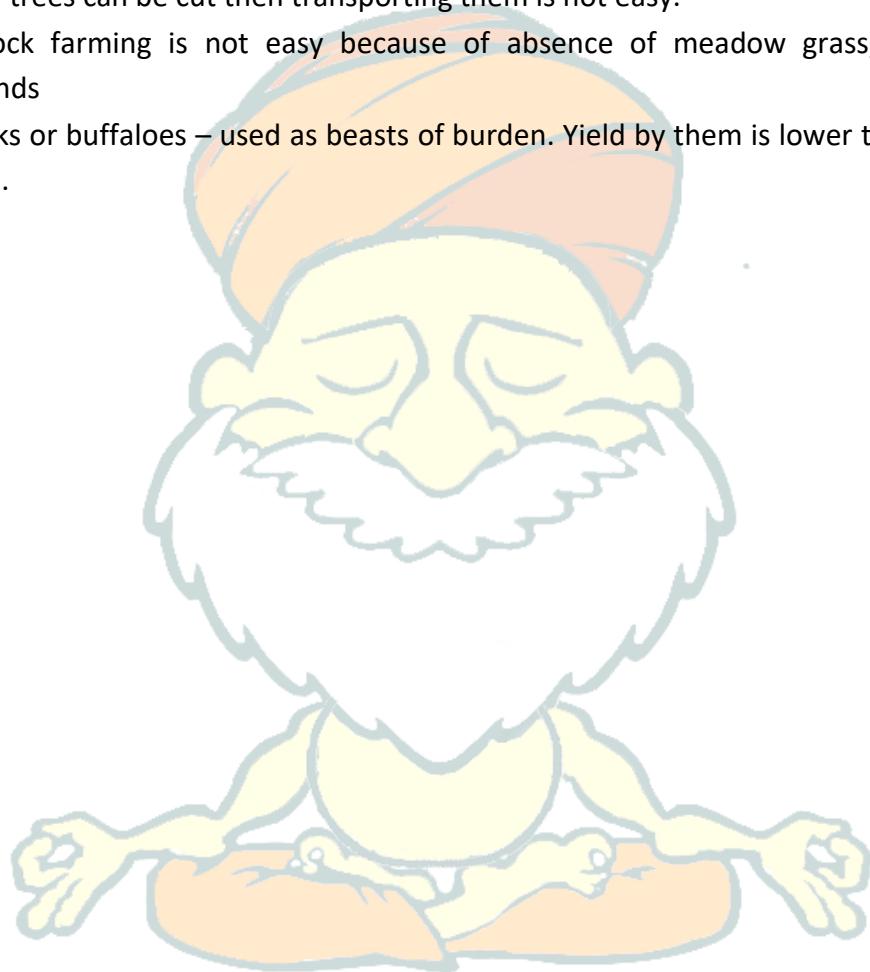


- Heavy leaf falls and decomposition of leaves by bacteria, a thick mantle of humus makes the soil fairly fertile. But shifting cultivation utilizes it.

- And remaining job is done by torrential downpours which remove the important nutrients from soil
- The soil degenerates rapidly with subsequent soil erosion and soil impoverishment
- Indonesian island of Java is an exception, because of its rich volcanic ashes and the energetic local people.

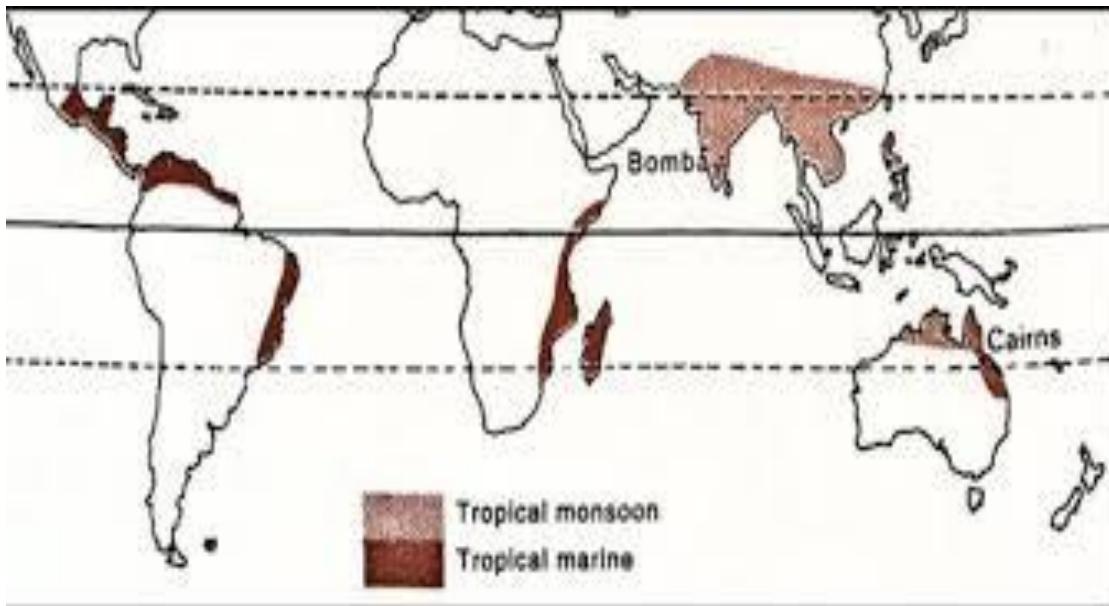
Difficulties in lumbering and livestock farming

- Though the tropics have great potential in timber resources, commercial extraction is very difficult.
- Even if trees can be cut then transporting them is not easy.
- Livestock farming is not easy because of absence of meadow grass, even on the highlands
- Bullocks or buffaloes – used as beasts of burden. Yield by them is lower than temperate cattles.



THE TROPICAL MONSOON AND TROPICAL MARINE CLIMATES

Distribution



- **On-shore wet monsoon** in summer
- **Off-shore dry monsoon** in winter
- **Countries** - Indian subcontinent- Myanmar, Thailand, Laos, Cambodia, parts of Vietnam and South China and Northern Australia
- **Tropical marine climate** – same climate is modified by on shore trade winds. It has even distribution rainfall. **Countries** - Central America, West indies, northeastern Australia, the Philippines, parts of East Africa, Madagascar, the Guinea Coast and eastern Brazil

Climatic Conditions in Tropical Monsoon Lands

- Basic cause of monsoon - difference in the rate of heating and cooling of land and sea.
- Summer- Sun is overhead at the Tropic of Cancer- the great land masses of the northern hemisphere are heated. Central Asia- intense low pressure region.
- Sea takes time to get heated and remain cool.
- While in southern hemisphere there is winter and so there is high pressure in the interior of Australia.
- Winds blow outwards as the South-East Monsoon to Java, and after crossing the equator are drawn towards the continental low pressure area reaching the Indian subcontinent as ***the South-West Monsoon***.

- Reverse condition in winter.

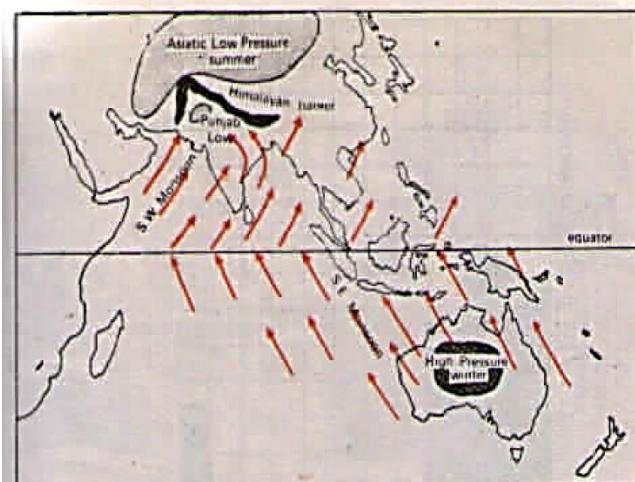
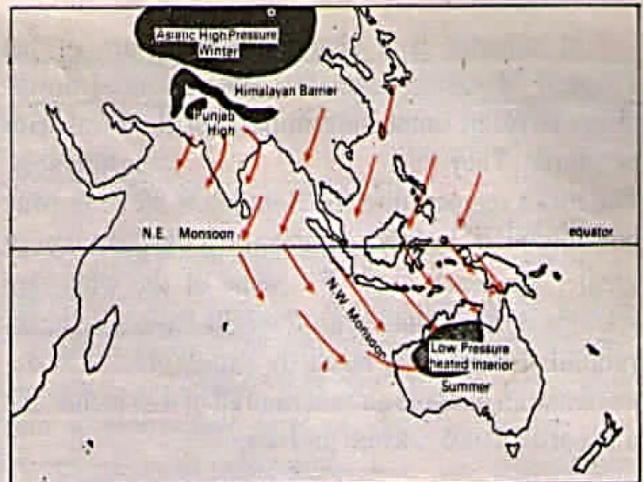


Fig. 125 (a) Summer conditions in Asia—South West Monsoon in Indo-Pakistan is on-shore in the rainy season (July)



(b) Winter conditions in Asia—North-East Monsoon in Indo-Pakistan is off-shore in the cool, dry season (January)

The Seasons of Tropical Monsoon Climate

- The tropical monsoon climate in Indian sub-continent have 3 distinct seasons –

The cool, dry season (Oct. to Feb)

- Temperatures are low
- In north frosts may occur at night
- Centre of high pressure (HP) – Punjab
- North east monsoon –dry winds – little or no rain to India
- Punjab gets small amount of rain fall, because of cyclonic sources, which is important for cereals.
- When north east monsoon blow over bay of Bengal they acquire moisture and bring rainfall to eastern coastal region like Andhra Pradesh and TN.

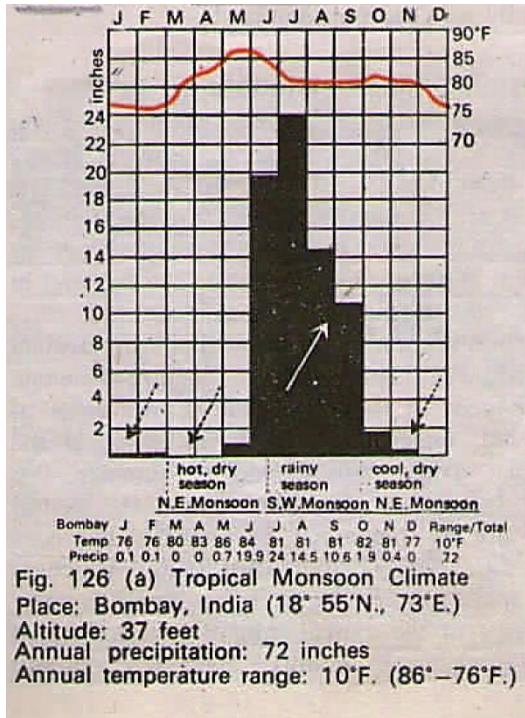
The hot dry season (March to mid-June)

- As Sun shifts towards tropic of cancer, temperature rises
- While Mumbai is moderate but still many parts are hotter and even schools and colleges are close for 2 months.
- Heat and low relative humidity is unbearable
- Coastal districts have some relief due to sea breeze.
- By May, low pressure is developed over North West India.
- We have seen Loo (strong, hot and dry summer afternoon wind from the west which blows over the western Indo-Gangetic Plain region of North India) also.
- Dust storms – frequent

- Rainstorms 'break' in middle of June.

The rainy season (mid-June to Sep)

- South west monsoon burst in mid-June.
- Almost whole of rain is this rainy season (95% rainfall in 4 months) (see graph also).
 - This concentration of rainfall is characteristic feature of topical monsoon climate



- There is torrential downpour all over country which immediately reduces the temperature.
- Some of the windward stations on the Himalayan foothills have very heavy rainfall, though this is partly orographic.
- Average annual rainfall, the wettest place is Mawsynram, Meghalaya, India, with 11,873 mm (467 in) of rain per annum.

The Retreating Monsoon

- The rain falls started to decrease gradually as the rainy season ends.
- It starts from northern India in mid-September and gradually moving back from whole of India.
- Monsoon role in India – farmers, drought, severe floods.

The Tropical Marine Climate

- A tropical marine climate is usually experienced by islands and coastal areas 10° to 20° north or south of the equator.
- They receive rainfall all the time because of trade winds.
- Rainfall – orographic as well as convectional
- The ocean is the main influence in creating the tropical marine climate.
- There are two main seasons — the wet season and the dry season.
- The annual rainfall is 1000 to over 1500 mm. (no month without rainfall)
- The temperature ranges from 25 °C to 35 °C.
- The trade winds blow all year round and are moist, as they have passed over warm seas.
- Due to the steady influence of the trades, the tropical marine climate is more favorable for habitation, but it is prone to severe tropical cyclones, hurricanes or typhoon.

Natural Vegetation



- Natural vegetation of tropical **monsoon** - Normally deciduous, because of dry period during which they shed their leaves to withstand drought.
- Natural vegetation of tropical **marine** - Heavy rainfall area's vegetation is forest. (southern Burma, peninsular India, northern Australia and coastal regions with a tropical marine climate)
- Open forest
- Less luxuriant v/s tropical

- Fewer species
- Yield valuable timber (best - teak)
 - Used for ship, building, furniture and other construction purposes
- Sal, acacia and eucalyptus - other varieties of timber
- Rainfall decrease in summer – forest → thorny scrubland or savanna with scattered trees and tall grass.
- Indian subcontinent has very less rainfall and so it has semi-desert conditions.
- And so Monsoonal vegetation is most varied, ranging from forests to thickets and from savanna to scrubland.

Agricultural Development in the Monsoon Lands

- Monsoon forests are cleared for farming.
- The huge population needs to be fed and so there is enormous pressure on land.
- In want of land forest are cleared nonstop and this had sometimes resulted in soil erosion
- Tropical agriculture is mainly rainfall dependent and countries like India, China, eastern Brazil etc. economy is agriculture dominated.

Types of agriculture



Wet paddy cultivation

- Rice – staple crop
 - Growing areas – tropical lowlands with 70-inch rainfall
 - Most characteristic crop of the monsoon land

- Total acreage of it > any other crop
- 2 main varieties of paddy –
 - wet paddy - grown on lowlands in flooded fields or in terraced uplands
 - dry paddy - regions of lower rainfall
- Minimum of 50 inches of rainfall is required during the growing season.
- Drought can be very detrimental to rice's cultivation.
- Irrigation water from rivers, canals, dams or wells is extensively used.
- Other food crops like maize, millet, sorghum, wheat, grain and beans are of subsidiary importance.

Lowland cash crops

- Range of lowland tropical cash crops is cultivated for the export market.
- Cane sugar is most important
- 2/3rd of world sugar production comes from tropical countries.
- Sugar grown on plantation or small land farms with abundant rainfall and sunshine
- Major producers – China, India, Java etc.

Jute

- Growing area - Ganges - Brahmaputra delta in India and Bangladesh.
- leading hard fibre for the manufacture of sacks
- Manila hemp from Philippines is used to make high quality ropes

Other crops

- Indigo (India and Java), Cotton, bananas, coconuts and spices.

Highland plantation crops

- Role of Europeans in introducing plantation crops in tropical has already been covered in previous chapter.
- They have also introduced tea and coffee plantation mainly for exports to Europe.
- **Coffee** was originally grown in Ethiopia and Arabia but now Brazil accounts for half of world's production.
 - Also cultivated on highland slopes between 2000 feet and 4500 feet in Central America, India and eastern Java.



Tea Plantation

- Tea was originally belonged to China, who is still an important producer of it.
 - Moderate temperature
 - Heavy rainfall
 - Highland slopes
- Also thrives in tropical monsoon zone but at higher altitude.
- Best region – Himalayan foothills of India and Bangladesh, Sri Lanka and western Java, China (for local only)

Lumbering

- From tropical forest – teak is in great demand and Burma is its leading producer
- Valuable because –
 - Great durability, strength, immunity to shrinkage, fungus attack and insects
 - Grown in - hilly districts (up to 3,000 feet altitude) with moderate rainfall.
 - If a tree is cut a new teak is planted as its replacement
 - Only way to ensure the steady supply.
 - 2nd greatest money earner for Burma after rice.
 - It takes as long as 100 years for a teak tree to mature into commercial timber.
- Green teak is heavy and so problem in transportation so it is 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.

Shifting Cultivation

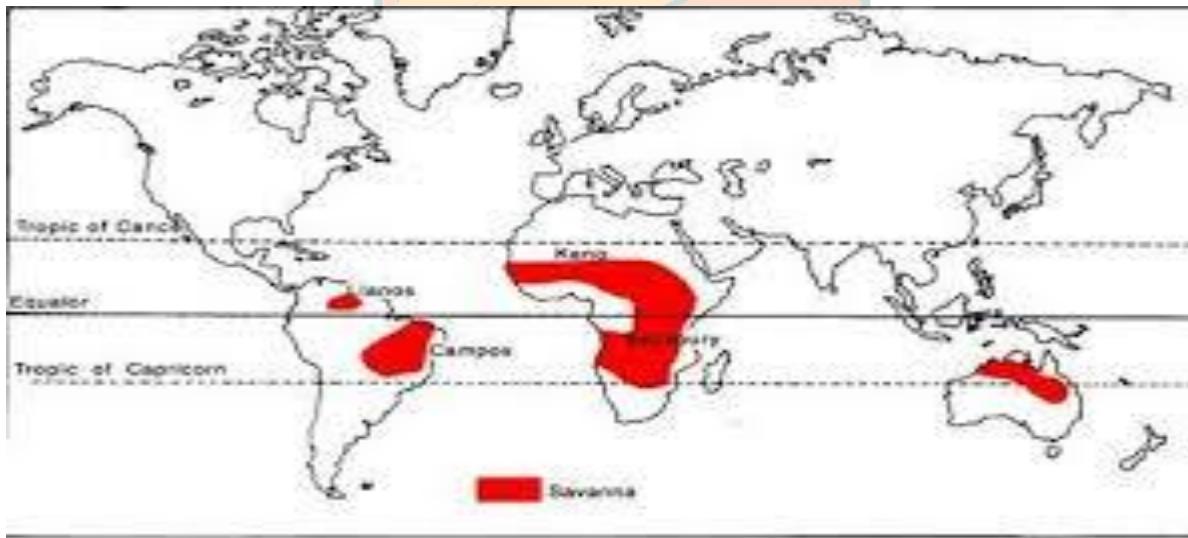


- Most local primitive form of farming.
- Tribesmen move to a new clearing when their first field is exhausted.
- The clearing of field is by fire which destroys everything in its way.
- After planting no attention to weeding or manuring.
- Crops are left at god's mercy
- Uses sticks and hoe
- Crops – maize or corn, dry padi, yams, tapioca, sweet potatoes and some beans are the most common crops.
- Farming is entirely for subsistence.
- Different local names of shifting cultivation –
 - Ladang in Malaysia
 - Taungya in Burma,
 - Tamrai in Thailand
 - Cangin in Philippines,
 - Humah in Java,
 - Chena in Sri Lanka
 - Milpa in Africa and Central America.

THE SAVANNA OR SUDAN CLIMATE

Distribution

- Transitional type of climate.
- **Found between** - the equatorial forests and the trade wind hot deserts.
- Confined within – tropics
- Best developed in - Sudan and so its name the Sudan Climate.
- In South America - two distinct regions of savanna north (Llanos) and south (Campos) of the equator
- The Australian savanna is located south of the monsoon strip running from west to east north of the Tropic of Capricorn.



Climate of the Sudan type

Rainfall

- Alternate hot, rainy season and cool, dry season.
- Northern hemisphere - hot, rainy season (May to September)
- Rest of year – cool and dry
- Length of rainy season and annual rainfall decreases from equator to pole ward towards desert fringes.
- Annual precipitation is less than that of the Tropical Monsoon Climate

Temperature

- Monthly temperature: 30° C – 32° C
- Annual temperature range : 6 - 7°C (\uparrow if move away from equator)
- Highest temperature coincides with onset of rainy season
- Days – hot (35°C)
- Night – clear sky (20°C), no night frost

Winds

- Prevailing winds – trade winds – rain to coastal areas.
- But it becomes dry by the time it reaches to west coast or interior of continents and so grass and scattered short trees.
- These dry winds in Africa are called as **Harmattan**, meaning the doctor.
- They are so dry that Relative Humidity (RH) is <30%
- It is such a dry dusty wind that besides ruining the crops, it also stirs up a thick dusty haze and impedes inland river navigation.

Natural Vegetation

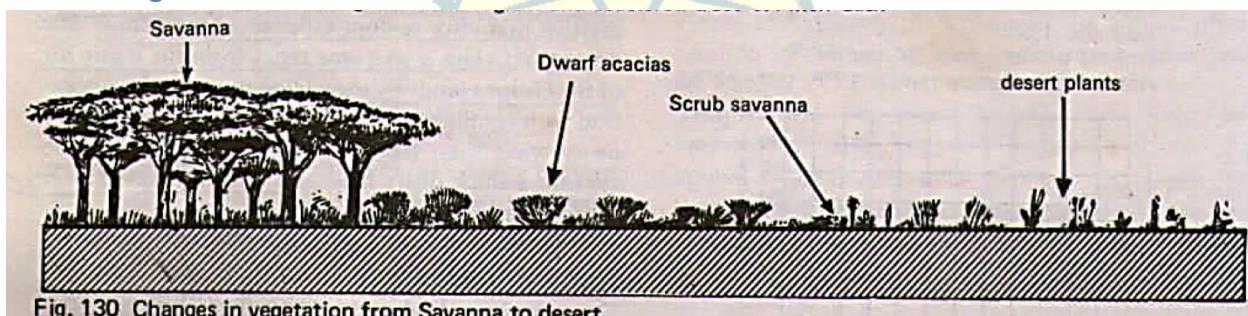


Fig. 130 Changes in vegetation from Savanna to desert

- Tall grass and short trees
- **Trees domination decreases when move from equator to polewards.**
- Trees – deciduous (e.g. acacia)
- Other trees – broad trunk (e.g. baobab and bottle trees)
- Trees are hard, gnarled and thorny and exude gum like gum Arabic & have umbrella shaped

Grass



Elephant Grass

- Tall and coarse (6-12 feet)
- Elephant grass (15 feet)
- Grow in compact tufts and has long roots.
- Dry season – yellow, dry and die
- Rainy season – greenish
- Dormant through long, rainless period
- Springs up again in next rainy season
- Rainfall ↓ - savanna merges with thorny scrub

Animal Life

- Africa - Home of wild animals
- also known as “big game country” (game - hunting)
- 1000s of animals are killed for their skins, tusk, horns, bones, hair.
- Wealth of animals is sometimes shown in movies as well

Grass eating herbivorous animals

- Alert and move swiftly in search of green pastures
- Run very fast to escape from their hunter.
- Grass eating – zebra, antelope, giraffe, deer, elephant

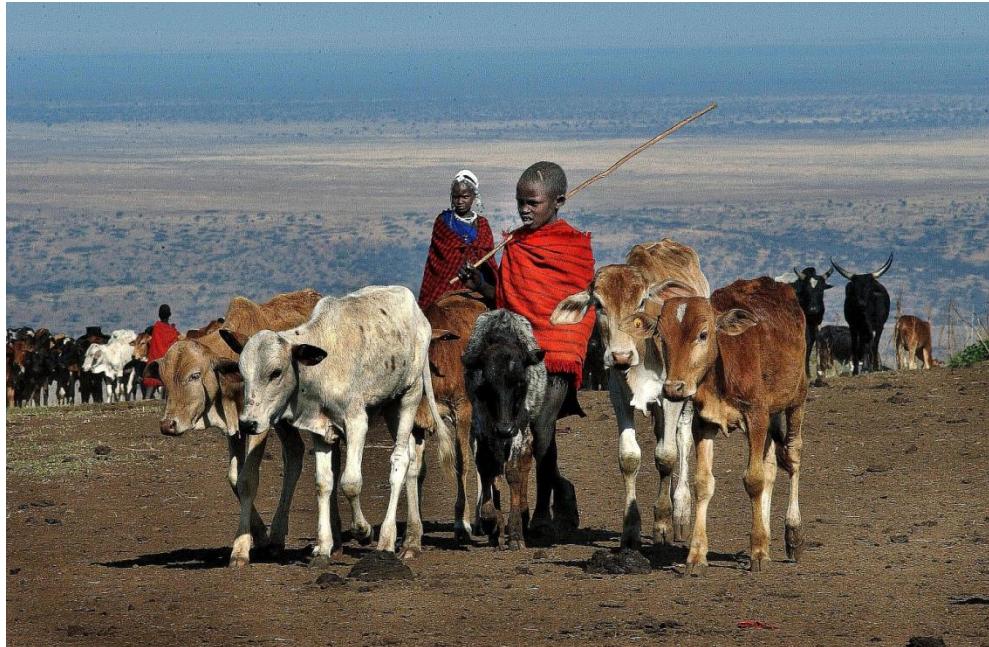
Flesh eating carnivorous animals

- Lion, tiger, puma, jaguar, jackal, jackal etc.
- Have powerful jaws and teeth to attack animals

- Reptiles and mammals - crocodiles, alligators, monitors, giant rhinoceros and hippopotamus.

Human Life in the Savanna

The Masai cattle pastoralists



- The Masai are a nomadic tribe.
- Now confined to the 15,000 square miles of **Masai reserves in Kenya and Tanzania**.
- When there is a drought the Masai move Upwards to the higher and cooler plateau regions in which their herds can graze on the better pastures.
- Live in huts made of sticks, bushes and mud.
- Zebu cattle with humps and long horns are kept
- They are treated with great respect and affection and are never slaughtered for food or for sale.
- Beef is only consumed when they die a natural death from old age or disease.
- Never used as draught animals
- Only for supply of blood and milk.
- Blood from both bulls and cows is drunk.
- Cows and bull's symbols of wealth.
- Goats and sheep has little significance
- They get food from agriculture tribes such as the Kikuyu of Kenya, they obtain a small amount of millet, bananas, groundnuts and vegetables.

- They will not willingly sell their cattle.

The Hausa, settled cultivators

- Tribe of settled cultivators who inhabit the savanna lands of the Bauchi Plateau of northern Nigeria.
- More advanced in their civilization
- Live in towns or villages
- Not practice shifting cultivation
- Instead, they clear a piece of land and use it for several years, growing a wide range of crops like maize, millet, Guinea corn, groundnuts, bananas and beans
- Some Hausa also cultivate nonfood crops e.g. Cotton and tobacco.
- When the fertility of the plot declines, they plant a new field and allow the old one to lie fallow.
- Also make use of domesticated animals. Herds of cattle and goats are kept for both milk and meat, but they are only subsidiary to crop cultivation.

Problems, Prospects and Development of the Savanna

- Immense agricultural potential for plantation agriculture of cotton, cane sugar, coffee, oil Palm, groundnuts and even tropical fruits.
- Kenya, Uganda, Tanzania and Malawi have already taken to large-scale production of cotton and sisal hemp.
- Both crops thrive well in savanna conditions. In west Africa the commercial cultivation of groundnuts, oil pam and cocoa have been gradually extended into the savanna lands
- Farming in the savanna land is not without natural hazards. **Droughts may be long and trying often unreliable.**
- Distinct wet-and-dry periods are also responsible for the rapid deterioration of soil fertility.
- Heavy rain cause leaching of nutrients which are dissolved and washed away
- Dry season evaporates water faster and land became saline.
- The savanna is said to be the natural cattle country.

Think

- Desertification
- Sahel region

THE HOT DESERT AND MID-LATITUDE DESERT CLIMATES

Distribution

- Regions of scanty rainfall.
- 2 types – hot and temperate
- Hot like the hot deserts of the Saharan type.
 - They are arid because of off shore trade wind.
 - Also called as Trade Wind Deserts.
- Temperate - the mid-latitude deserts like the Gobi.
 - Reason for aridity - because of their interior location in the temperate latitudes, well away from the rain bearing winds.
- Major hot desert location – western coast of continents between 15° and 30° N and S latitudes.

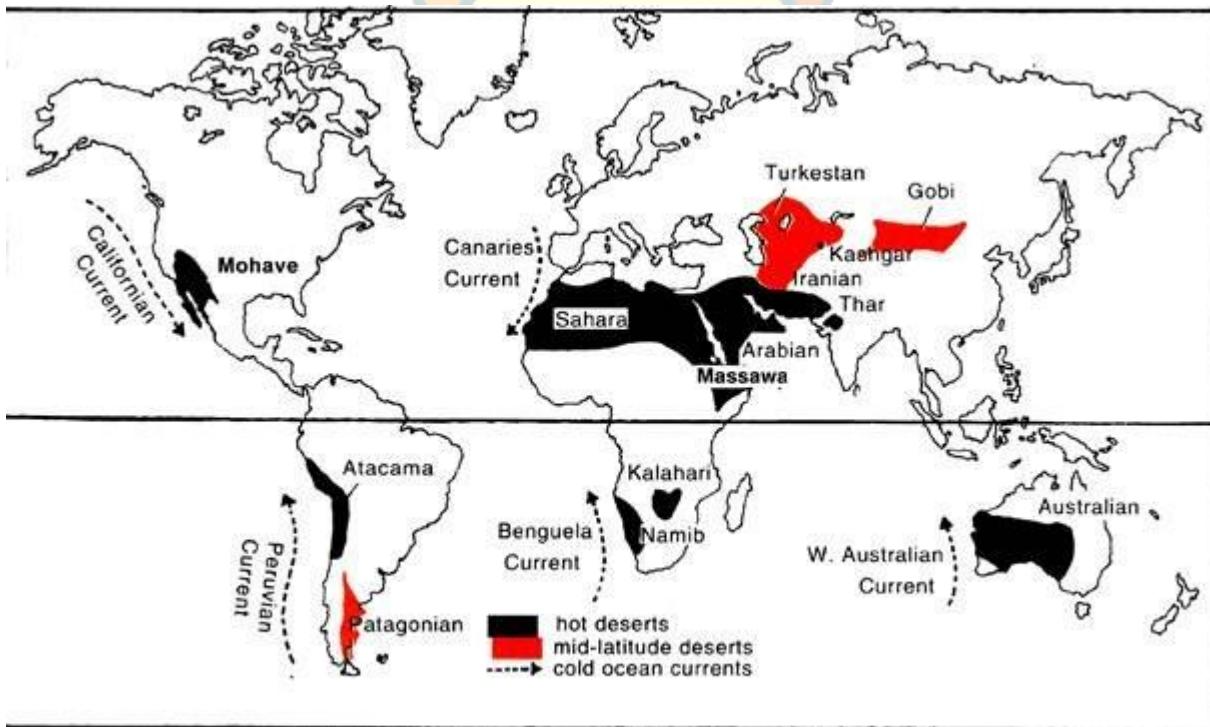


Fig. 131 The hot deserts and mid-latitude deserts of the world

Hot Deserts



- Sahara Desert (Biggest desert)
- Australian desert
- Arabian Desert
- Iranian Desert
- Thar Desert
- Kalahari and Namib Deserts
- Californian desert (also known as Mohave, Sonoran and Mexican deserts)
- Atacama desert
- Peruvian desert
- Mid latitude desert
 - Gobi- rain shadow desert
 - Turkestan
 - Patagonian Deserts-South America (it is due to rain-shadow position on the leeward side of the lofty Andes than to continentality)

Climate

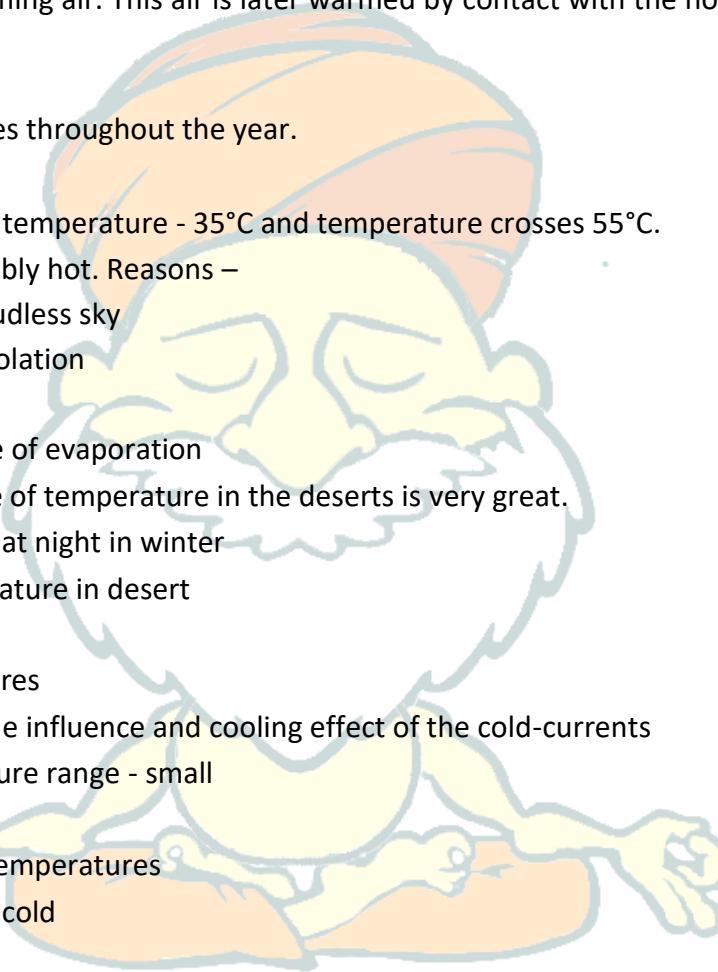
Rainfall

- Both types of deserts have an annual precipitation - <10 inches
 - William Creek in Australia - 5.4 inches.
 - Kotah in India - 4 inches
 - Yuma, Arizona, U.S.A. has 3.3 inches.
 - In Salah in the mid-Sahara and Arica in the mid - Atacama **have practically no rain at all.**

- The hot desert lies extending across the horse latitudes or the subtropical high pressure belts **where the air is descending**, a condition least favorable for precipitation of any kind to take place.
- The rain bearing **trade winds blow off-shore** and **the westerlies that are on-shore blow outside the desert limits**.
- Winds blow **from cooler to warmer regions**, and their relative humidity is lowered making condensation impossible and **so desert are regions of permanent drought**.
- On the western coasts, the presence of cold currents gives rise to mists and fogs by chilling the oncoming air. This air is later warmed by contact with the hot land, and little rain falls.

Temperature

- High temperatures throughout the year.
- No cold season
- Average summer temperature - 35°C and temperature crosses 55°C.
- Days are unbearably hot. Reasons –
 - Clear, cloudless sky
 - Intense isolation
 - Dry air
 - Rapid rate of evaporation
- The diurnal range of temperature in the deserts is very great.
- Frosts may occur at night in winter
- Extremes temperature in desert



Coastal deserts

- Lower temperatures
- Reason – maritime influence and cooling effect of the cold-currents
- Annual temperature range - small

Desert interiors

- Higher summer temperatures
- Winter months – cold

Climatic Conditions in the mid-latitude Deserts

- Many ways similar to those of hot deserts.
- Sometimes unexpected convectional storms may bless the parched lands with brief showers in summer
- Snow falls in winter.
- Summers are very hot and winters are extremely cold with two months below freezing point.

- Annual range of temperature is greater than hot deserts (reason - continentality)
- Winters - freezing lakes and rivers, and strong cold winds blow all the time. When the ice thaws in early summer floods occur in many places.

Desert Vegetation



- All deserts have some form of vegetation like grass, scrub, herbs, weeds, roots or bulbs.
- They may not appear green all the time but they lie dormant
- No moisture in environment and so excessive heat is most unfavorable for growth of plants
- Predominant vegetation of both types are – xerophytic or drought-resistant scrub.
- It includes the bulbous cacti, thorny bushes, long rooted wiry grasses and scattered dwarf acacias.
- Trees are rare
- Along the western coastal deserts washed by cold currents as in the Atacama Desert, the mists and fogs, formed by the chilling of warm air over cold currents, roll inland and nourish a thin cover of vegetation.
- Plants highly specialized adapting themselves to the arid environment
- Absence of moisture retards the decomposition process and desert soils are very deficient in humus.
- Plants have long roots in search of food, moisture.
- Leaves of plants are reduced to spine so that less transpiration. The stem is thick waxy part and it stores food for drought.

Economy

- Despite its inhospitality, the desert has always been peopled by different groups of inhabitants.
- Some, like the Egyptians have attained a **high level of civilization**, others like the Bedouin Arabs have fared quite well with their flocks of sheep, goats, camels and horses.
- Of the primitive tribes, **the Bushmen and the Bindibu** are the best known. Both the tribes are **nomadic hunters and food gatherers**, growing no crops and domesticating no animals. The Bushmen roam the Kalahari Desert.
- The Bindibu or Aborigines of Australia live in very much the same way as the Bushmen.
- They **domesticate the dingo**, a wild dog that assists them in tracking down kangaroos, rabbits and birds.
- They live in **wurlies**, simple shelters made of branches and tufts and grass.
- The Bedouin of Arabia ride on horses and live in tents; the Tuaregs of the Sahara and camel riders and dwell in grass zeriba, while the Gobi Mongols ride on horses to herd their yaks and live in portable yurts (a kind of tent).
- The lure of **mineral wealth** has attracted many immigrants into the desert.
- It was gold that brought immigrants scrambling into the Great Australian Desert.
- Some of them like Kalgoorlie and Coolgardie have become towns of considerable size.
- In the **Kalahari Desert**, the discovery of diamonds and copper has brought many white men to the 'thirst land' as it is called.
- Even in the most arid Atacama, in northern Chile, large mining camps have been established for the mining of caliche (cemented gravels) from which sodium nitrate, a valuable fertilizer, is extracted and exported to all parts of the world. Besides nitrates, copper is also mined.
- **Escondida copper mine in Chile** is the World's largest copper mine.
- In the **deserts of North America**, silver is mined in Mexico, uranium in Utah and copper in Nevada.
- In recent years, the discovery of oil in many parts of the Saharan and Arabian Deserts has transformed this forgotten part of the globe.

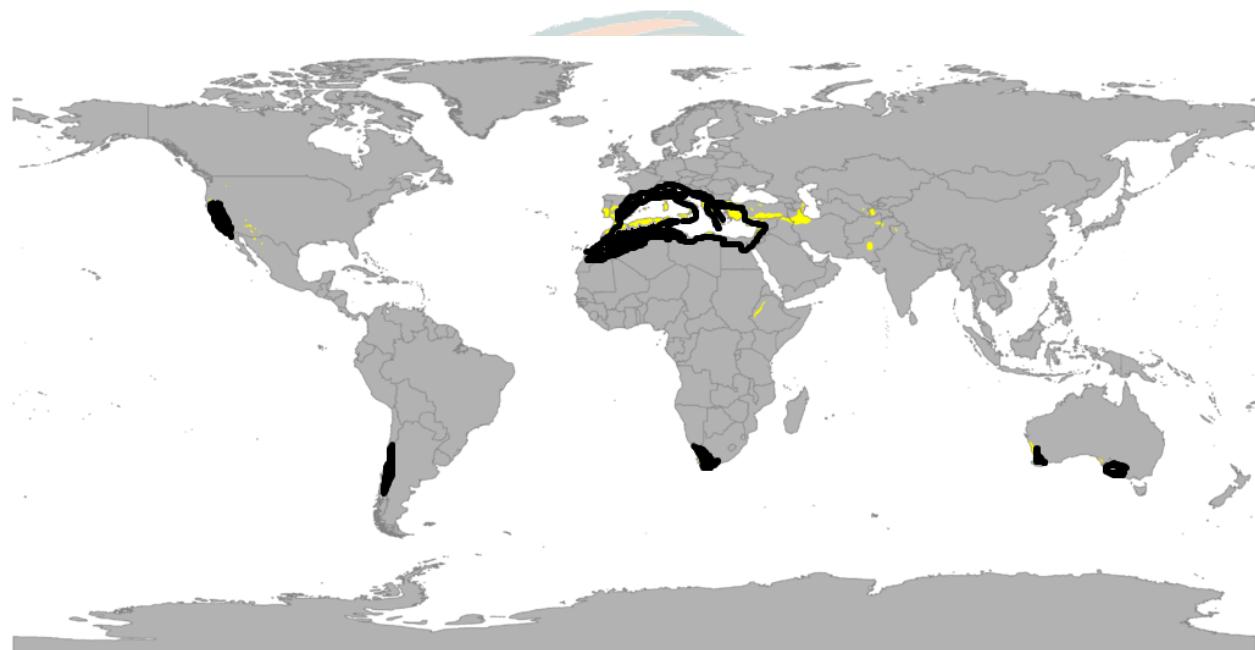
THINK!

- Remember the names of famous deserts of the World- prepare continent wise and classification wise (hot, cold and coastal)

THE WARM TEMPERATE WESTERN MARGIN (MEDITERRANEAN) CLIMATE

Distribution

- Region – western portion of continental masses between 30° and 45° N and S of equator.
- Reason or cause of this climate – shifting of wind belts
- Mediterranean region found in world –Mediterranean Sea, Central Chile, California, south west tip of Africa, southern Australia and south west Australia.



Climate

- The Mediterranean climate is characterized by dry summers and mild, moist winters.
- Mediterranean climate zones are associated with the five large subtropical high pressure cells of the oceans: The Azores High, South Atlantic High, North Pacific High, South Pacific High, and Indian Ocean High.
- These climatological high pressure cells shift towards the poles in the summer and towards the equator in the winter, playing a major role in the formation of the world's subtropical and tropical deserts as well as the Mediterranean Basin's climate.
- **Azores High** - it is associated with the Mediterranean climate found in southern Europe and north Africa and the Sahara Desert
- **South Atlantic High** - it is similarly associated with the Namib Desert and the Mediterranean climate of the western part of South Africa.
- **North Pacific High** – it is related to the Sonoran Desert and California's climate.
- **South Pacific High** – it is related to the Atacama Desert and central Chile's climate

- **Indian Ocean High** – it is related to the deserts of Western Australia (Great Sandy Desert, Great Victoria Desert, and Gibson Desert) and the Mediterranean climate of southwest and south-central Australia.

Precipitation

- During summer, regions of Mediterranean climate are dominated by subtropical high pressure cells, with dry sinking air capping a surface marine layer of varying humidity and making **rainfall impossible** or unlikely except for the occasional thunderstorm.
- While during winter the polar jet stream and associated periodic storms reach into the lower latitudes of the Mediterranean zones, bringing rain, with snow at higher elevations.
- As a result, areas with Mediterranean climate receive almost all of their precipitation during their **winter, autumn and spring seasons**, and may go anywhere from 4 to 6 months during the summer without having any significant precipitation.
- Toward the equatorial latitudes, **winter precipitation decreases** as a share of annual precipitation as the climate grades equatorward into the steppe climate normally too dry to support non-irrigated agriculture.
- Toward the polar latitudes, total moisture usually increases; in Europe there is more summer rain further north while along the American west coast the winters become more intensely wet and the dry seasons shorter as one moves north.

Temperature

- This climate has **relatively mild winters and very warm summers**.
- However, winter and summer temperatures **can vary greatly between different regions** with a Mediterranean climate.
- E.g. in the case of **winters**, Lisbon experiences very mild temperatures in the winter, with frost and snow practically unknown, whereas Dushanbe has colder winters with annual frosts and snowfall.
- **Summer** - Athens experiences rather high temperatures in that season (48 °C (118 °F) has been measured in nearby Eleusis). In contrast, San Francisco has mild summers due to the upwelling of cold subsurface waters along the coast producing regular summer fog that does not reach far inland.
- In low season the temperatures could be up to 20 °C (68 °F).

Natural vegetation

The native vegetation must be adapted to survive long, hot summer droughts and prolonged wet periods in winter. Mediterranean vegetation examples include the following -

- **Evergreen trees** - pines, cypresses, and oaks
- **Deciduous trees** - sycamores, oaks, and buckeyes
- **Fruit trees** - olives, figs, citrus, walnuts and grapes
- **Shrubs** - Bay laurel, ericas, banksias, and chamise
- **Sub-shrubs** - such as sages, artemisias, and sagebrush
- **Grasses** - grassland types, Themeda triandra, bunchgrasses, sedges, and rushes
- **Herbs** - fragrant rosemary, thyme, and lavender.

Economic development of the Mediterranean regions

- Even after semi-arid conditions the climate is favorable.
- Warm, bright summers and cool, moist winters enable wide ranges of crops to be cultivated.

Orchard farming



- Also known as world's **orchard lands**
- Range of **citrus fruits** – oranges, lemon, limes, citron and grapefruit are grown
- Like we have Nagpur ka santara (Orange). Similarly, they have lots of different shapes and sizes oranges (Sunkist orange – best known orange)
- 70% of world's fruits export – by this region
- Like we use coconut oil, they have palm oil, which is for versatile purposes.

Crop cultivation

- **Wheat** – leading food crop
 - but the conditions are not ideal as temperate lands has.
 - The grown wheat is **hard, winter wheat**
- Next popular cereal – **barley**
- **Irrigation for crops** – water from melting snow
- **Lowlands** – intensive cultivation
- **Hill slopes** are **terraced** for farming.
- **Haciendas** – large farm holdings in Spain.

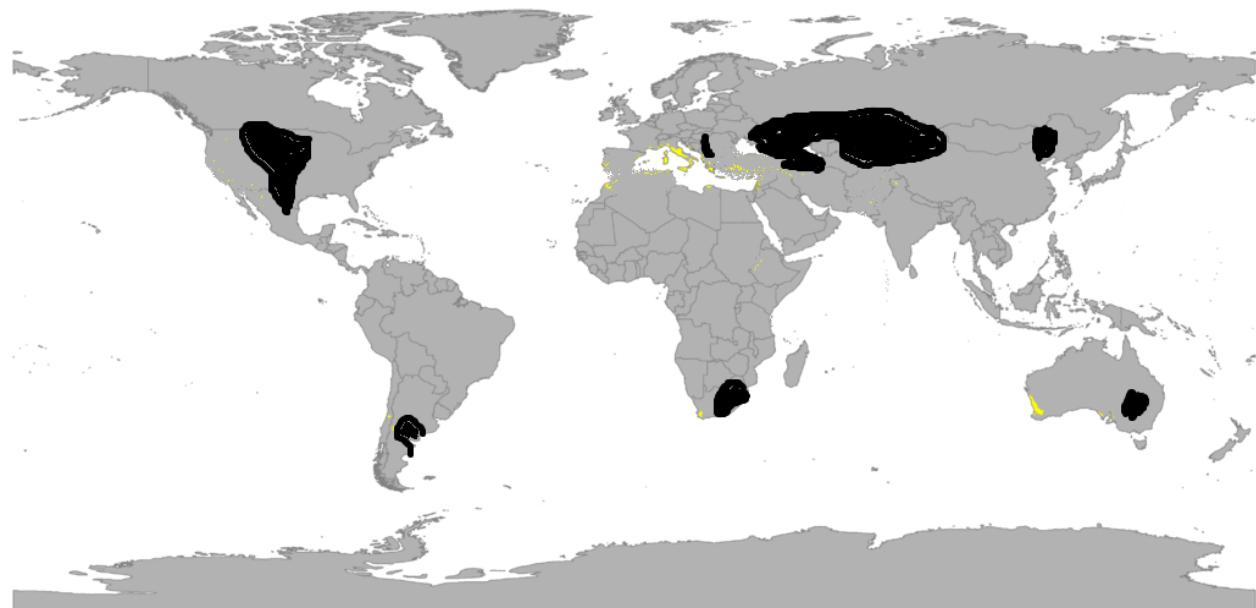
Wine production

- Another specialty of the Mediterranean countries, because the best wine is essentially made from grapes.
- 85% of grapes go into wine
- Med. Sea = $3/4^{\text{th}}$ of world's wine production.
- Spain, Portugal France, and Italy, wine is the national drink
- Commercial viticulture is almost entirely confined to the Mediterranean regions.
- The wine from southern Spain is called Sherry.
 - Portugal port – **wine**
 - **Chianti, asti and marsala** come from different parts of Italy.
 - **Champagne** -Paris basin, **Bordeaux** - Garonne basin, **Burgundy** - Rhone-Saone valley. (France has the greatest wine regions)
- Most of the inferior grapes are preserved as dried grapes and exported. They are known by several names e.g. **currants** – Levantine grapes, **raisins** from California and **sultanas** from Asia minor.

THE TEMPERATE CONTINENTAL (STEPPE) CLIMATE

Distribution

- Bordering the deserts
- In the interiors of continents
- Lie in the westerly wind belt, they are so remote from maritime influence that the grasslands are practically treeless
- Northern hemisphere grasslands are extensive and entirely continental.



- North America grasslands – **prairies**
- Eurasia – “**steppes**” (distribution – see map)
- Due to the narrowness of the temperate portions of the southern continents, the grasslands are rather **restricted** and **less continental**.
- Argentina and Uruguay – **pampas**
- Africa – **bush-veld** and **high veld** (sandwiched between Drakensberg and the Kalahari Desert)
- Australia – **downs**

Climate

Temperature

- Location of these regions is center of continents and so little maritime influence → **extreme temperature**
- Warm summers
- Cold winters

- There is a tremendous difference between the annual temperature range of the northern and southern hemisphere, again a factor of continentality.

In southern hemisphere not severe

- Mild winter (temperature – 35°F to 55°F).
- Exceptional case – winter month even below freezing point
- Annual range of temperature great because of continentality.
- Winters cold
- Snow melts in spring

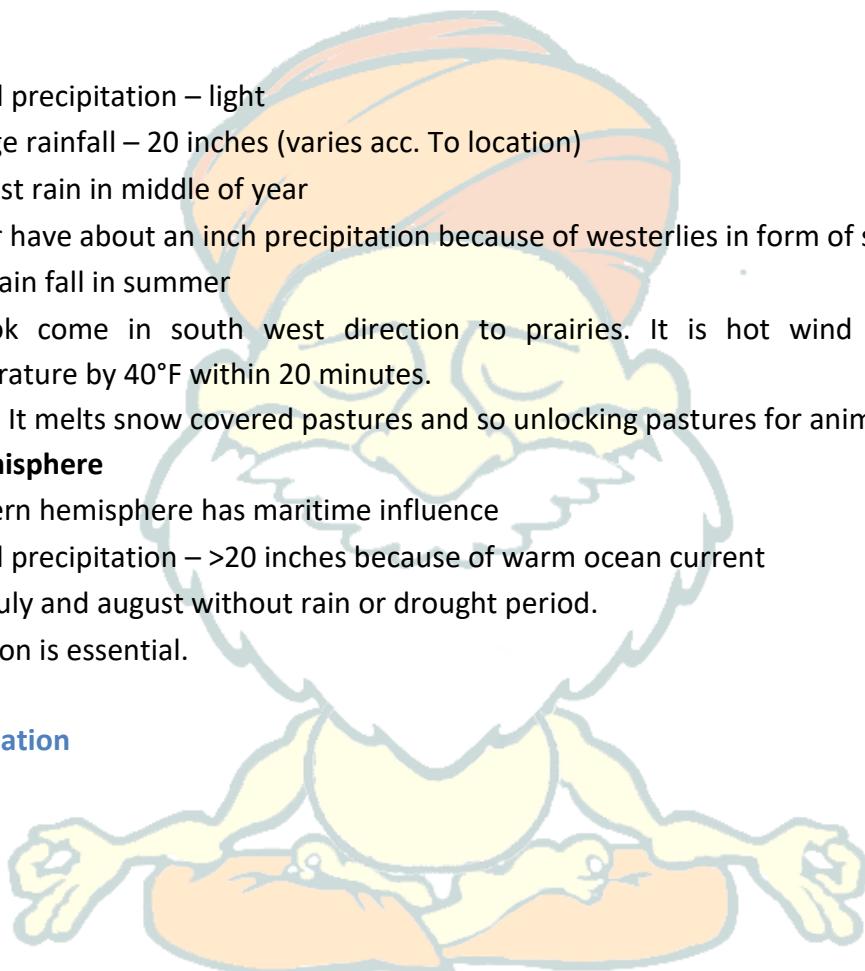
Precipitation

- Annual precipitation – light
- Average rainfall – 20 inches (varies acc. To location)
- Heaviest rain in middle of year
- Winter have about an inch precipitation because of westerlies in form of snow.
- Most rain fall in summer
- Chinook come in south west direction to prairies. It is hot wind and raise the temperature by 40°F within 20 minutes.
 - It melts snow covered pastures and so unlocking pastures for animals

Southern hemisphere

- Southern hemisphere has maritime influence
- Annual precipitation – >20 inches because of warm ocean current
- June, july and august without rain or drought period.
- Irrigation is essential.

Natural Vegetation





- Steppe vegetation – it includes scanty vegetation of the sub-arid lands and also include the temperate grassland all over the world
- The difference between steppes and the tropical savanna is that they are practically treeless and the grasses are much shorter.
- Steppe areas are less suitable for arable farming.
- Climatic requirements are different from trees as grasses require less precipitation + they can remain dormant in drought period.
- The appearance of the temperate grasslands varies with seasons.
 - **Spring** – grasses are green, fresh and blooming with small, colorful flowers. The light rainfall that comes in late spring stimulates their growth
 - **Summer** – so much heat and evaporation that grasses turn into yellowish and soon brown
 - **Autumn** – grasses withers and die but roots remain alive and lie dormant throughout winter
 - **Winter** - harsh and long, but the snow is never of great depth. Everything is quiet but with the next spring cycle repeated and steppe is alive again.
- **Trees** – scarce because of scanty rainfall, long droughts and severe winters.
 - The rolling plain is an endless stretch of grass whether green or brown, except along the water courses where a few low willows, poplars or alders break the monotony.

Economy

- The temperate grasslands were once the home of grazing animals; wild horses in the Asiatic Steppes, swift-footed bison in the Prairies and untamed buffaloes in the Pampas.
- Even as recently, as the last century, these grasslands were dominated by nomadic and semi-nomadic peoples like the Krichiz of the Asiatic Steppes.
- The grasslands have been ploughed up for extensive, mechanized wheat cultivation and are now the '**granaries of the world**'.
- Besides **wheat, maize** is increasingly cultivated in the warmer and wetter areas. The tufted grasses have been replaced by the more **nutritious Lucerne or alfalfa grass**.



Figure alfalfa grass

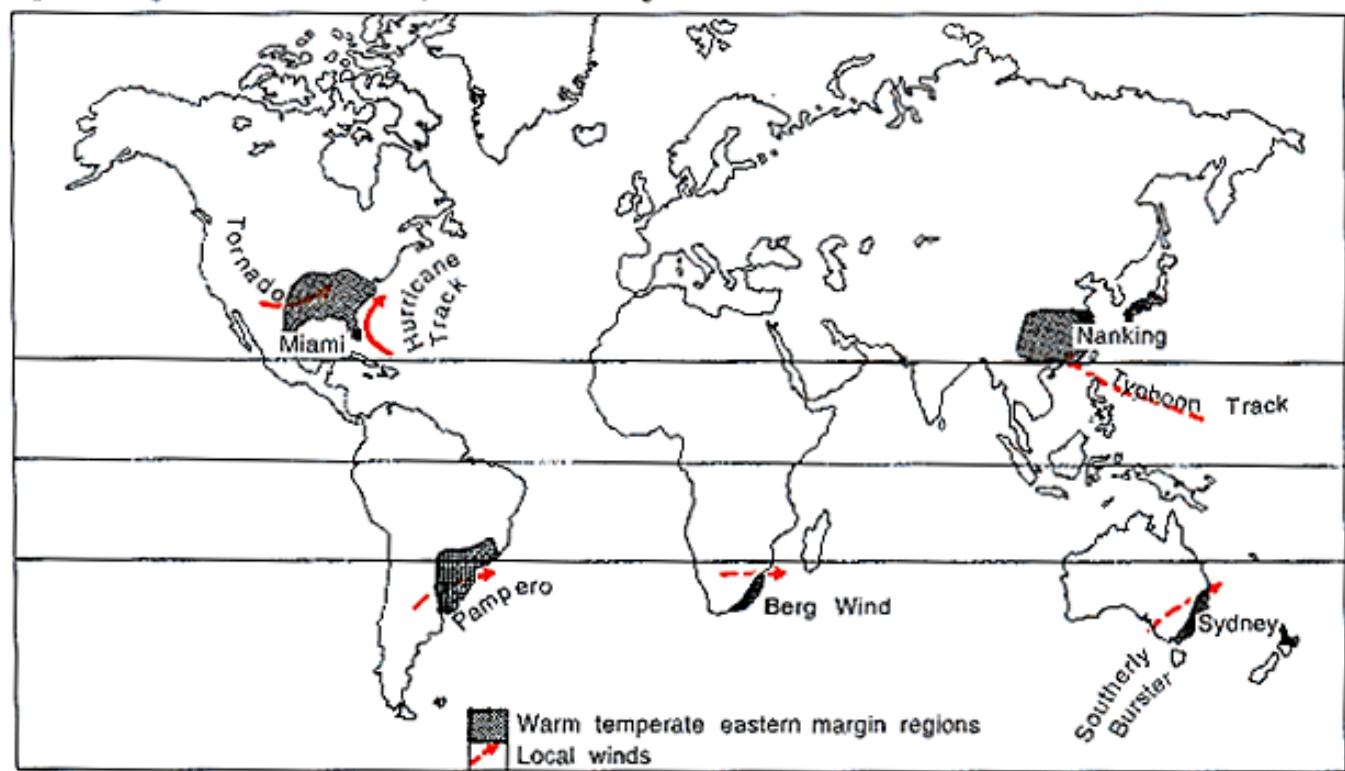


THE WARM TEMPERATE EASTERN MARGIN CLIMATE

Distribution

- **Found between** - 30° and 40° N and S of the equator.
- **Found in** - N and S China, Southern Japan and Korea, South East USA, South Brazil and North Argentina south-east coastal region of Africa and New South Wales and Queensland of Australia or eastern or eastern margins of continents in warm temperate latitudes, just outside the tropics.
- It is, in fact, the climate of most parts of China—a modified form of monsoonal climate.
- It is thus also called the Temperate Monsoon or China Type of climate. In south-eastern U.S.A., bordering the Gulf of Mexico, continental heating in summer induces an inflow of air from the cooler Atlantic Ocean.
- It is sometimes referred to as the **Gulf type of climate**.

Fig. 144 Regions with a Warm Temperate Eastern Margin Climate



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South Wales



Queensland

Climate

- It has warm moist summer and cool dry winter.
- **Summer temperature** - varies from 21°C to 27°C
- **Winter temperature** - 5°C to 12°C.
- **Rainfall** - varies from 75 cm to 125 cm and occasionally affected by the hurricane.
- The China climate can be sub-divide into three main types –

a) **The China type:** Central and north China, including southern Japan (temperate monsoonal)

- Most typical climate of warm temperate eastern margin
- In summer, Intense heating in heart of Asia creates low pressure and then monsoon winds etc. (we have read this please revise)
- In winter → tropic of Capricorn → high pressure → retreat monsoon
- Occurrence of typhoons.

b) **The Gulf type:** South-eastern United States, (slight-monsoonal)

- Climate similar to that of central China except that the monsoonal characteristics are less well established. No complete seasonal wind reversal.
- Warm Gulf Stream and the on-shore Trade Winds help to bring about this narrow range of temperature
- Summers are warm and pleasant.
- Annual rainfall is heavy.
- There is no distinct dry period as in monsoon lands
- The amount of rain is increased by the frequent thunderstorms in summer and by hurricanes in September and October.

c) **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.

Natural Vegetation

- Areas with high summer temperature and heavy rainfall favor luxuriant evergreen vegetation.
- Deciduous type of forest is found in the places with moderate rainfall and temperature.
- Pines and cypress in highlands and mountains.
- Well suited for grass, ferns, bamboos and palms.
- Mulberry trees thrive best.
- The **lowlands** carry both **ever-green broad-leaved forests** and **deciduous trees** quite similar to those of the tropical monsoon forests.
- On the **highlands**, are various species of conifers such as **pines and cypresses** which are important soft-woods
- The plant's growth is not obstructed by either a dry season as in the Mediterranean, or a cold season as in the cool temperate regions, **conditions are well suited to a rich variety of plant life** including grass, ferns, lianas, bamboos, palms and forests.
- The well distributed rainfall all the year round makes the regions look **green at all times**.
- Warm temperate eastern margins are the **homes of a number of valuable timber species**.
- In eastern Australia the most important are **eucalyptus** trees, with scanty foliage and thick fern undergrowth.
 - Some very tall, **over 250 feet** and they make hardy timber.
 - The Australian **Alps of Victoria and the Blue Mountains of New South Wales** have great reserves of temperate eucalyptus forests that make up part of the timber exports of Australia.



Gum trees



Plant

- From the forests of south-eastern Brazil, eastern Paraguay, north-eastern Argentina come valuable warm temperate timbers such as the Parana pine, and the quebracho

(axe-breaker, an extremely hard wood used for tanning) and wild yerba mate trees, from which the leaves are gathered for making Paraguay tea.



Quebracho tree



Plant



Paraná pine



[More images](#)

Yerba mate



Plant

- The **highlands** yield extensive fore of **chestnuts, ironwood and black woods**. An unusual occupation is the commercial cultivation of wattle trees in plantations for tanning extracts and for use in Natal's coal mines as pit-props.
- The forests of China and southern Japan also have considerable economic value and include oak, camphor, camellia and magnolia.
- Deforestation has resulted in many barren hill-slopes that are still feeling the impact of soil erosion. The Gulf States of U.S.A. have lowland deciduous forests. The trees grow close together with thick undergrowth and leafy branches.
- Walnut, oak, hickory and maple are some of the more common species, while in the sandier regions grow pines. Much of the forest cover has given way to the cultivation of sub-tropical crops like cotton, maize and fruits.



Mulberry trees



Deciduous forest



Cypress- Pine trees

Wildlife

- Densely populated with different types of animals.
- Many types of birds and animals in mountain and swamps with unique adaptions suited for seasonal life.
- The bald eagle, night angle, cardinals and hawks are some of the birds.
- Common animals are squirrels, bear, beavers, foxes, deer, rats, snake and wolves.



Bald Eagle



Rats



Nightingale

Human Settlement

- Most productive parts, adequate rainfall, no prolonged droughts and warm cold season.
- Summer is the busiest time for farming.
- China and Southern Japan accounts one-third of the World's population.
- Agriculture is the main occupation.
- Paddy is the main crop, rice, tea and mulberries are also grown.
- Besides agriculture, mining, industries, tourism, dairy farming, fishing, silk farming are other main occupation.



Human settlement



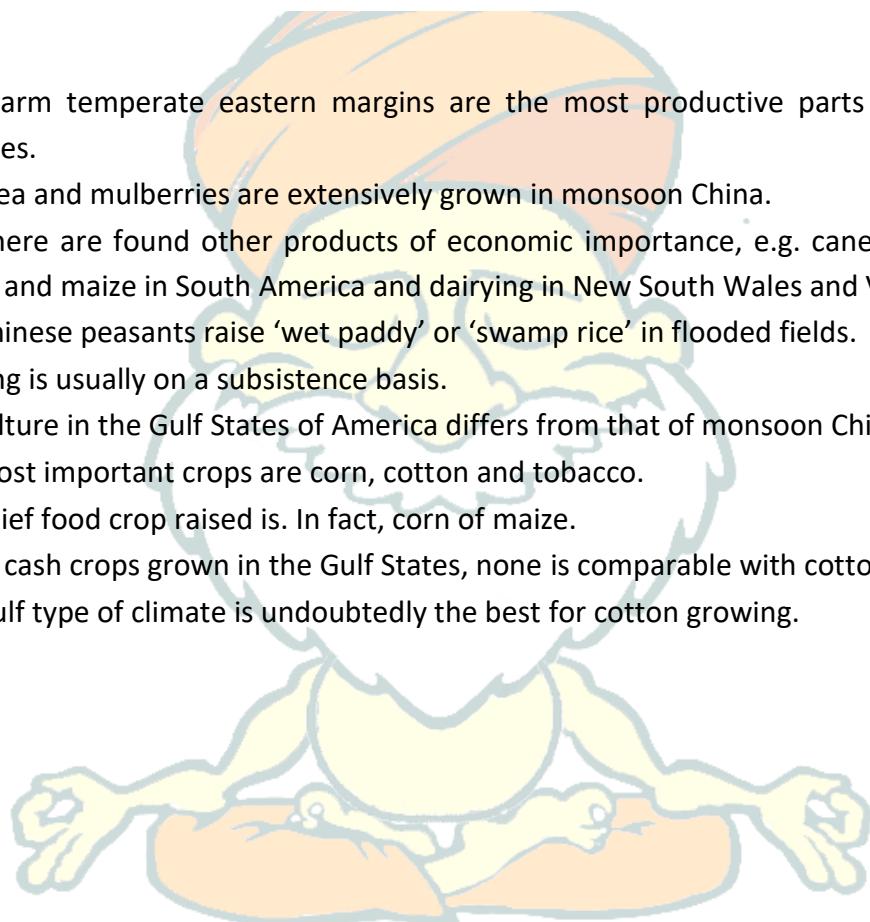
Farming in Australia



Mining in australia

Economy

- The warm temperate eastern margins are the most productive parts of the middle latitudes.
- Rice, tea and mulberries are extensively grown in monsoon China.
- Elsewhere are found other products of economic importance, e.g. canesugar in Natal, coffee and maize in South America and dairying in New South Wales and Victoria.
- The Chinese peasants raise 'wet paddy' or 'swamp rice' in flooded fields.
- Farming is usually on a subsistence basis.
- Agriculture in the Gulf States of America differs from that of monsoon China.
- The most important crops are corn, cotton and tobacco.
- The chief food crop raised is. In fact, corn or maize.
- Of the cash crops grown in the Gulf States, none is comparable with cotton.
- The Gulf type of climate is undoubtedly the best for cotton growing.



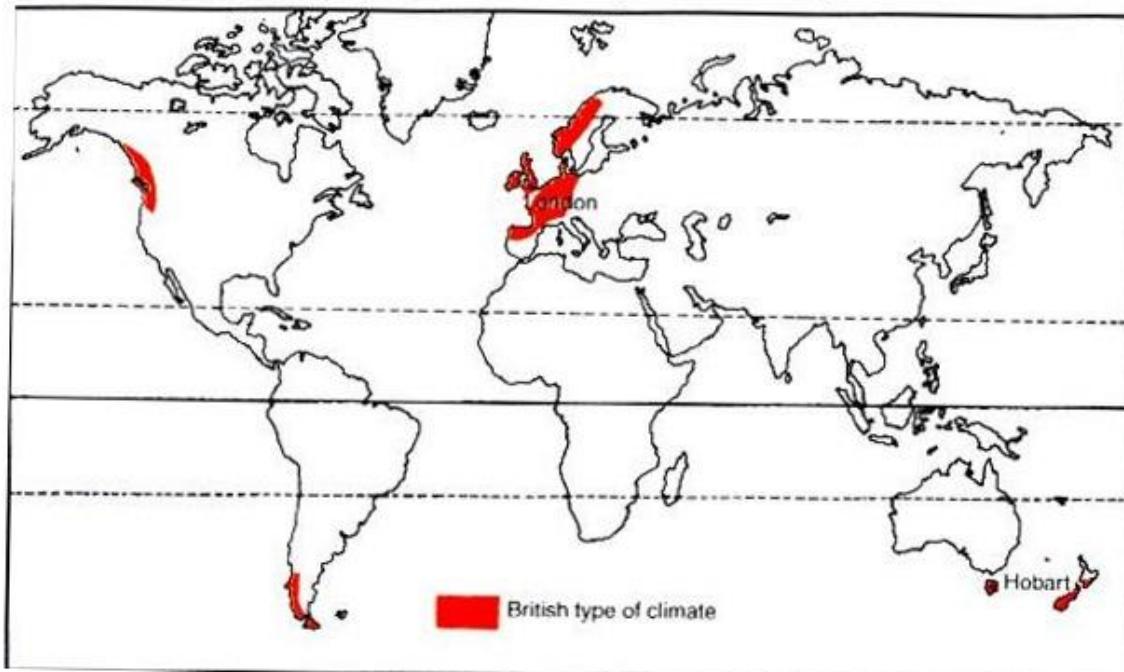
THE COOL TEMPERATE WESTERN MARGIN (BRITISH TYPE) CLIMATE

Distribution

- The **cool temperate western margins** are under the permanent influence of the **Westerlies and cyclonic activity** all-round the year and so have British type climate.
- **Regions in northern hemisphere**- From Britain, the climatic belt stretches far inland into the lowlands of North-West Europe, including such regions as northern and western France, Belgium, the Netherlands, Denmark, western Norway and also north-western Iberia.
- There is so much oceanic influence on both the temperature and the precipitation that the climate is also referred to as the **North-West European Maritime Climate**.
- **Regions in southern hemisphere** - the climate is experienced in southern Chile, Tasmania and most parts of New Zealand, particularly in South Island.



Fig. 147 Regions with Cool Temperate Western Margin Climate (British type).



Climate

- The **mean annual temperatures** are usually between 40°F and 60°F.
- The warmest month is 63°F and the coldest month is just around 40°F, thus giving an **annual temperature range** of only 24°F.
- **Summers** are, in fact, never very warm.
- The climate is ideal for maximum comfort and mental alertness.

- Winters are abnormally mild.
- The British type of climate has adequate rainfall throughout the year with a tendency towards a slight winter or autumn maximum from cyclonic sources.
- Since the rain-bearing winds come from the west, the western margins have the heaviest rainfall.
- The amount decreases eastwards with increasing distance from the sea.

Natural Vegetation

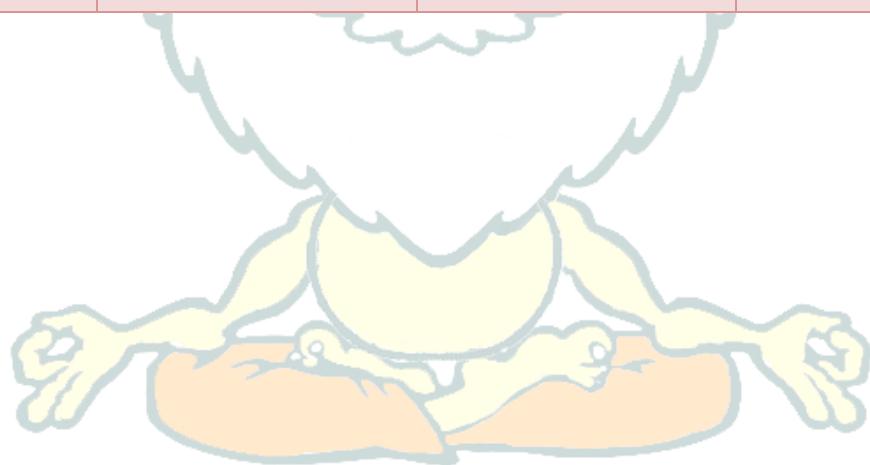
- The natural vegetation of this climate type is deciduous forest. (details already covered in previous chapters)
- Some of the more common species include oak, elm, ash, birch, beech, poplar, and hornbeam.
- In the wetter areas grow willows, alder and aspen. Elsewhere are found other species, e.g. chestnut, sycamore, maple, and lime.
- The deciduous hardwoods are excellent for both fuel and industrial purposes.
- In Tasmania, the temperate eucalyptus is also extensively felled for the lumbering industry.
- Unlike the equatorial forest, the deciduous trees occur in pure stands and have greater lumbering value from the commercial point of view. The open nature of the forests with sparse undergrowth is useful in logging operations

Economy

- A very large part of the deciduous woodlands has been cleared for fuel, timber or agriculture.
- Fishing is particularly important in Britain, Norway and British Columbia.
- Though market gardening is practiced throughout the world wherever there is large urban population, nowhere else is it so highly specialized as in North-West Europe.
- In north-western Europe intensive market gardening is carried out in many specialized areas e.g. the Vales of York and Evesham in the United Kingdom.
- It is no wonder the Australians nicknamed Tasmania the 'garden state'.
- Throughout Britain and northwestern Europe, farmers practice both arable farming and pastoral farming.
- Amongst the cereals, wheat is the most extensive grown.
- The next most important cereal raised in the mixed farm is barley.
- The most important animals kept in the mixed farm are cattle. North-western Europe was originally the home of many world renowned cattle breeds.

- Britain is the home of some of the best known sheep breeds, e.g. Leicesters, Lincolns and Southdown's.
- In the southern hemisphere, sheep rearing is the chief occupation of New Zealand, with its greatest concentration in the Canterbury Plain.

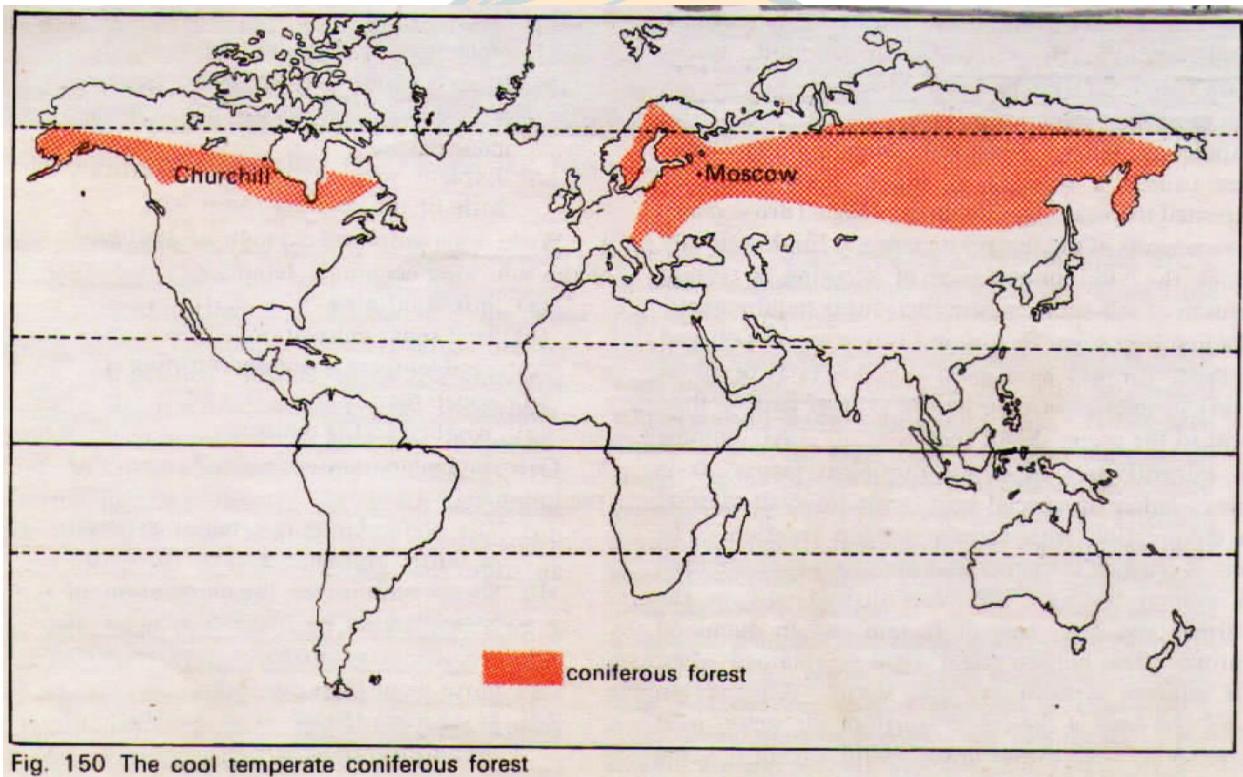
| CLIMATIC TYPE | CHARACTERISTICS | DISTRIBUTION CONTINENT) | SELECTED STATION (COUNTRY) |
|-------------------------------|--|---|--|
| Western margin (British type) | Under the Influence of westerlies lies all the year round and also the regions of much cynic activity. Warm Summers and Mild winters with four distinct seasons. Ideal for maximum comfort and mental alertness. | Best developed in British Columbia (Western Canada), Northwest Europe, coastal Southern Chile (South America, Tasmania (Australia) and South Island Of New Zealand. | Vancouver (Canada), London (British Isles), Hobart (Tasmania). |



THE COOL TEMPERATE CONTINENTAL

Distribution

- The Cool Temperate Continental (Siberian) Climate is experienced only in the northern hemisphere where the continents within the high latitudes have a broad east-west spread.
- On its pole ward side, it merges into the Arctic tundra of Canada and Eurasia at around the Arctic Circle.
- South wards, the climate becomes less severe and fades into the temperate Steppe climate.



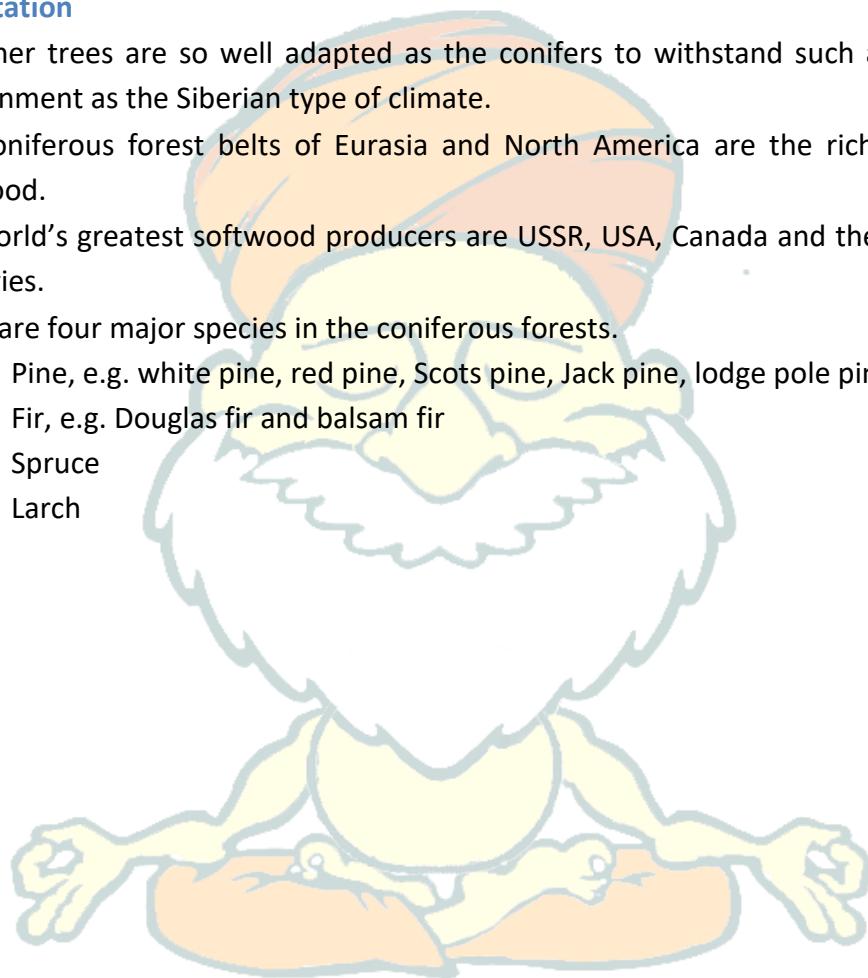
Climate

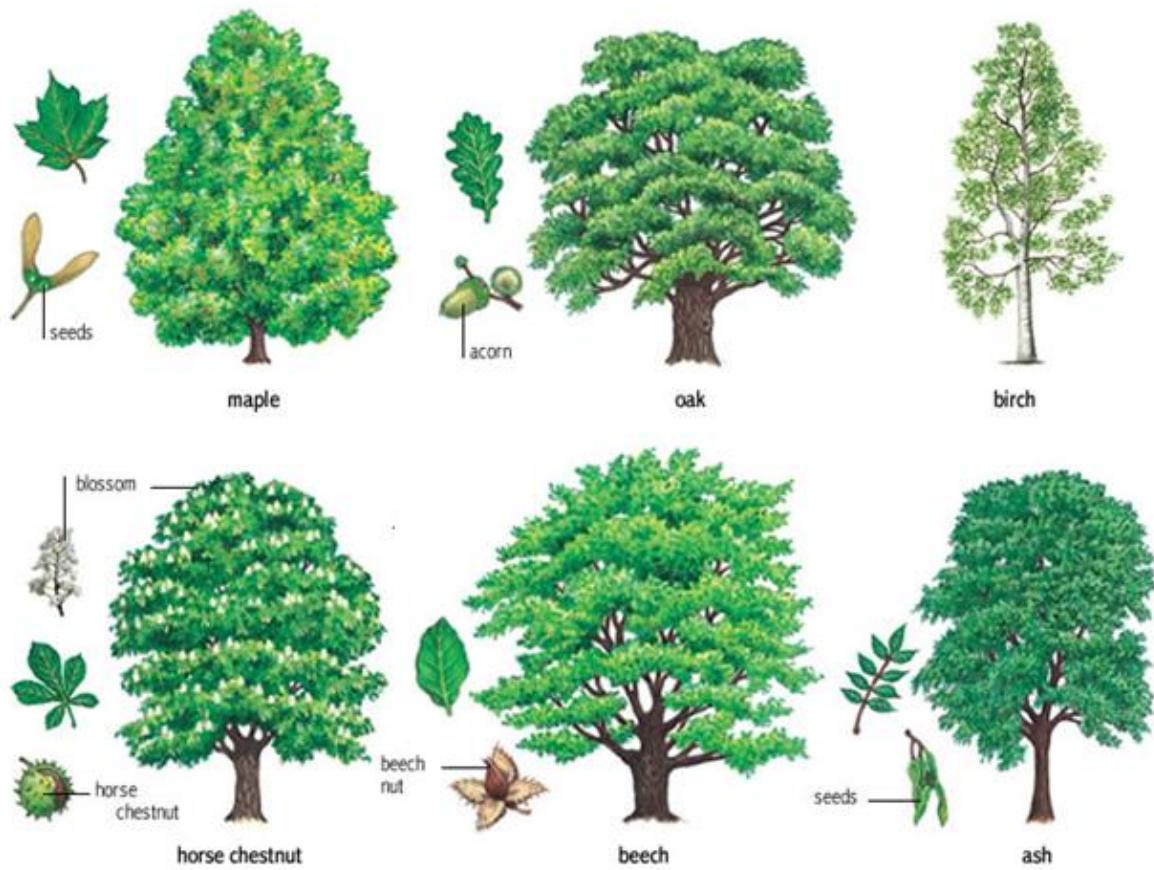
- The climate of the Siberian type is characterized by a bitterly cold winter of long duration, and a cool brief summer.
- Spring and autumn are merely brief **transitional periods**.
- The isotherm of 50°F for the warmest month forms the pole ward boundary of the Siberian climate and the winter months are always below freezing.
- An **annual range** of 54°F is common in the Siberian type of climate.
- The **extremes of temperature** are so great in Siberia that it is often referred to as the '**cold pole of the earth**'.

- The interiors of the Eurasian continent are so remote from maritime influence that annual precipitation cannot be high.
- Generally speaking, a total of 15 to 25 inches is typical of the **annual precipitation** of this sub-Arctic type of climate.
- It is quite well distributed throughout the year, with a summer maximum from convectional rain.
- In winter the precipitation is in the form of snow.

Natural Vegetation

- No other trees are so well adapted as the conifers to withstand such as inhospitable environment as the Siberian type of climate.
- The coniferous forest belts of Eurasia and North America are the richest sources of softwood.
- The world's greatest softwood producers are USSR, USA, Canada and the Fennoscandian countries.
- There are four major species in the coniferous forests.
 - Pine, e.g. white pine, red pine, Scots pine, Jack pine, lodge pole pine
 - Fir, e.g. Douglas fir and balsam fir
 - Spruce
 - Larch





Economy

- The coniferous forest regions of the northern hemisphere are comparatively little developed.
- The various species of pine, fir larch and spruce are felled and transported to the saw-mills for the extraction of temperate soft-woods.
- There is little agriculture as few crops can survive in the sub-Arctic climate of these northerly lands.
- Only in the more sheltered valleys and the land bordering the steppes are some cereals (barley, oats, rye) and root crops (potatoes) raised for local needs.
- Many of the Samoyeds and Yakuts of Siberia, and some Canadians are engaged in hunting, trapping and fishing.

| CLIMATIC TYPE | CHARACTERISTICS | DISTRIBUTION (CONTINENT) | SELECTED STATION (COUNTRY) |
|--|---|---|---|
| Central continental type or Siberian type | Characterized by a bitterly cold winter and cool brief summer with light rain. Only in Northern Hemisphere. | Best developed in the interior of North America and Eurasia between latitudes 35° N and 60°N. | Churchill (Manitoba, Canada), Moscow (Russia) |



THE COOL TEMPERATE EASTERN MARGIN (LAURENTIAN)

Distribution

- The Cool Temperate Eastern Margin (Laurentian) Climate is an **intermediate type** of climate between the British and the Siberian type of climate.
- It has **features of both** the maritime and the continental climates.
- Laurentian type of climate is found only in two regions.
 - One is north-eastern North America, including eastern Canada, north-east USA. This may be referred to as the North American region.
 - The other region is the eastern coastlands of Asia, including eastern Siberia, North China, Manchuria, Korea and northern Japan.
- It may be referred to as the Asiatic region.
- 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.
- The only possible location is in eastern Patagonia, south of Bahia Blanca to Terra del Fuego.

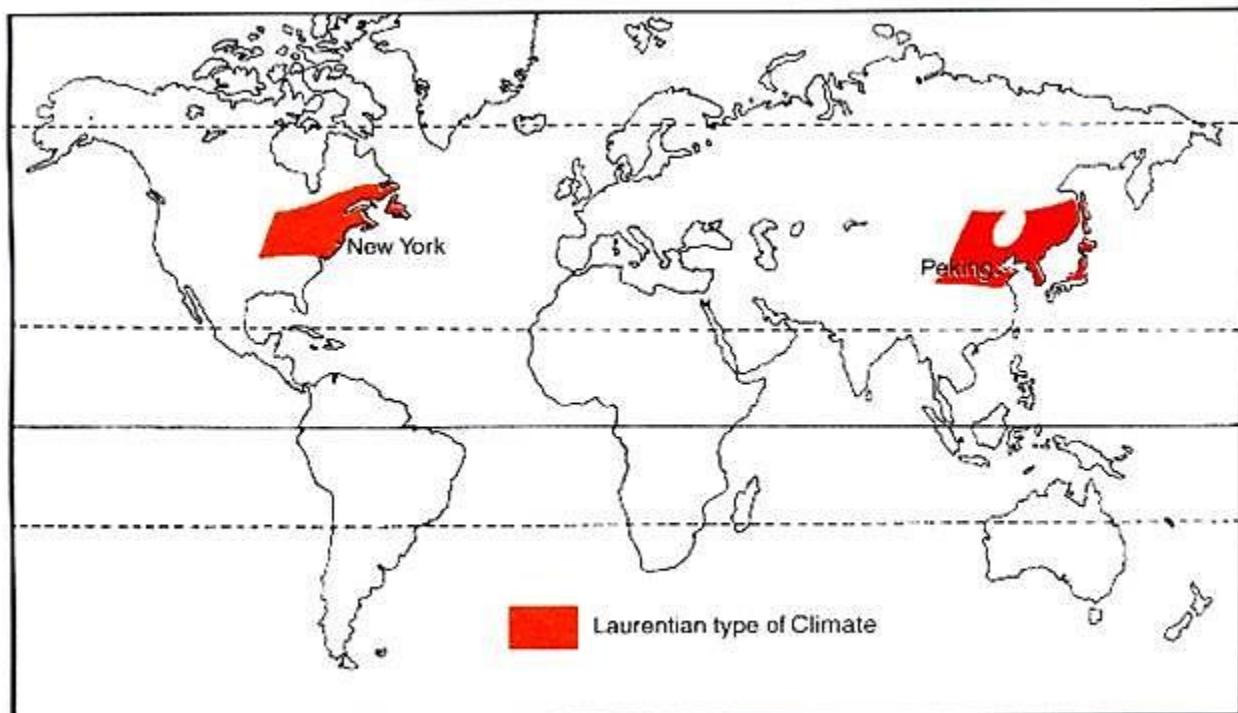


Fig. 153 Regions with a Cool Temperate Eastern Margin Climate (Laurentian type)

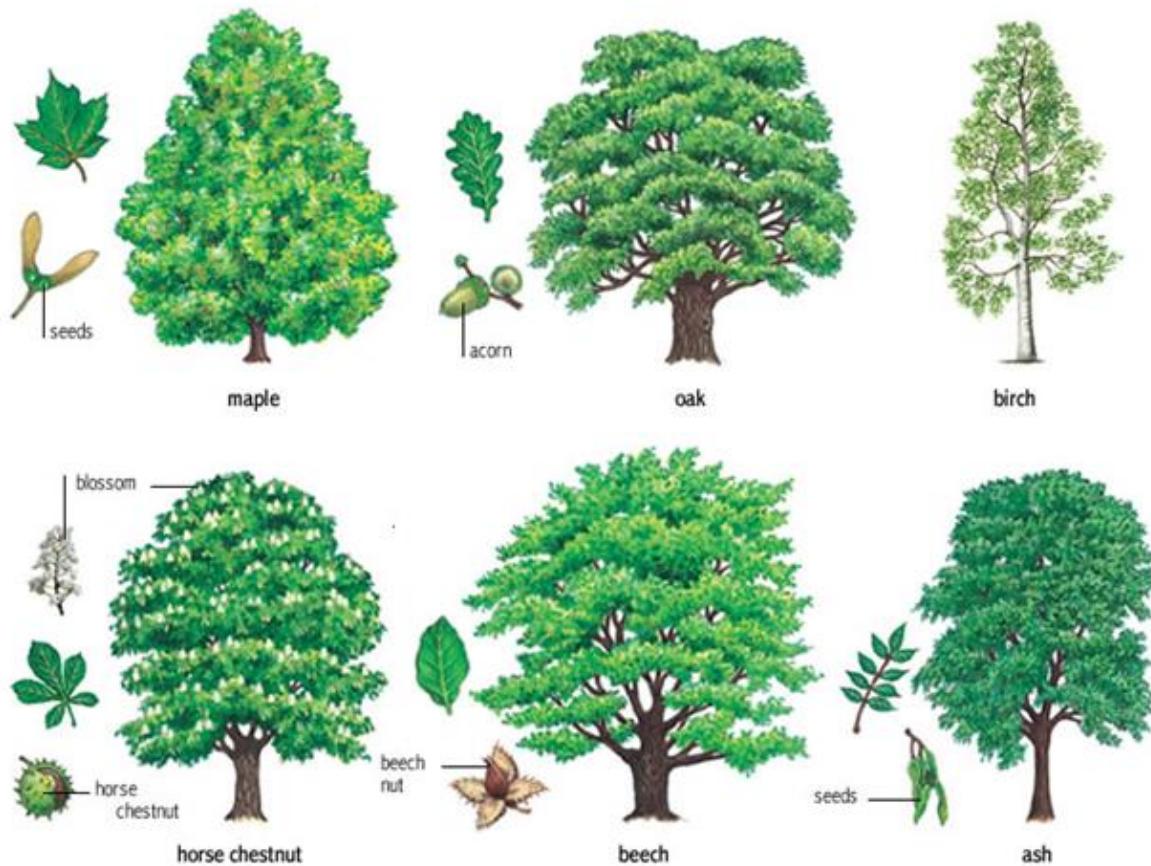
Climate

- The Laurentian type of climate has **cold, dry winters and warm, wet summers**.
- Winter temperatures may be well below freezing-point and snow falls to quite a depth.
- **Summers** are as **warm**, as the tropics (70° - 80°F).

- Though rain falls throughout the year, there is a distinct summer maximum from the easterly winds from the oceans.
- Of the annual precipitation of 30 to 60 inches, two-thirds come in the summer.

Natural vegetation

- The predominant vegetation of the Laurentian type of climate is cool temperate forest.
- Generally, the forest tends to be **coniferous** north of the 50°N parallel of latitude.
- In the Asiatic region, the coniferous forests are, in fact, a continuation of the great coniferous belt of the taiga.
- South of latitude 50°N, the coniferous forests give way to deciduous forests. Oak, beech, maple and birch are the principal trees.



Economy

- Lumbering and its associated timber, paper and pulp industries are the most important economic undertaking.
- Lumbering has always been a major occupation of this sparsely populated part of eastern Asia and timber is a leading export item.
- Agriculture is less important in view of the severity of the winter and its long duration.
- Potatoes thrive over large areas of the podzolized soils, while hardy cereals like oats and barley can be sown and successfully harvested before the onset of the cold winter.



Podzolization Process

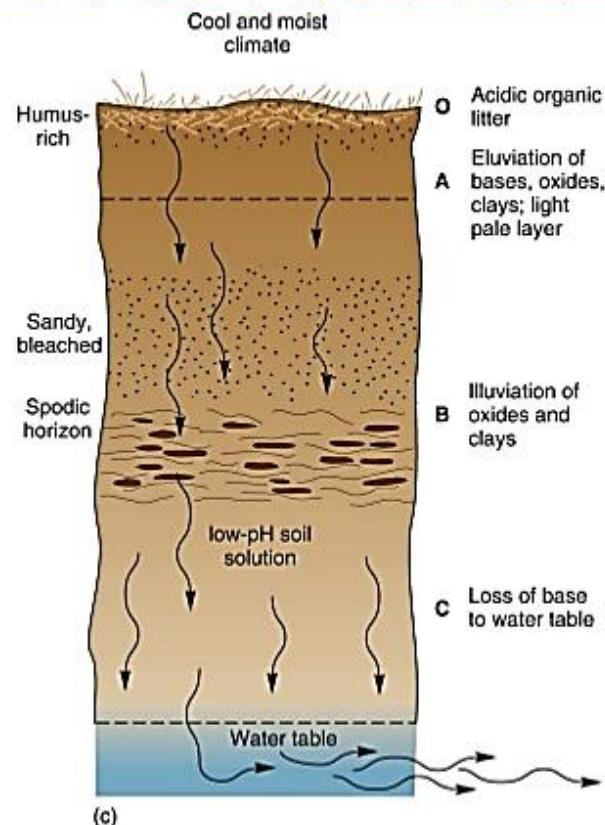


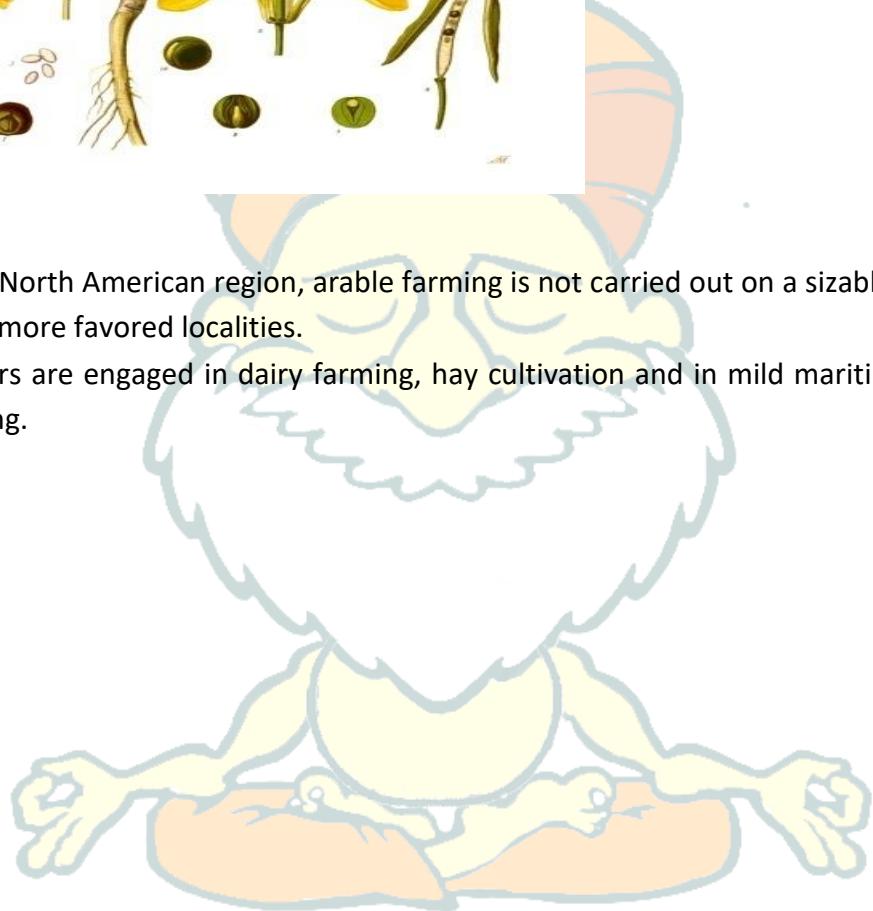
Figure 15.20

- A number of other interesting crops are produced in the Asiatic region such as soya beans groundnuts, sesame, rape seeds, tung oil and mulberry.



Figure rape seed

- In the North American region, arable farming is not carried out on a sizable scale, except in the more favored localities.
- Farmers are engaged in dairy farming, hay cultivation and in mild maritime areas, fruit growing.



THE ARCTIC OR POLAR CLIMATE

Distribution

- The polar type of climate and vegetation is found mainly north of the Arctic Circle in the northern hemisphere.
- The ice-caps are confined to Greenland and to the highlands of these high-latitude regions, where the ground is permanently snow covered.
- The lowlands, with a few months ice-free, have tundra vegetation.

Climate

- The polar climate is characterized by a very low mean annual temperature and its warmest month in June seldom rises to more than 50°F.
- Winters are long and very severe, summers are cool and brief.
- At the North Pole, there are six months without light in winter.
- The ground remains solidly frozen for all but four months, inaccessible to plants. Frost occurs at any time and blizzards, reaching a velocity of 130 miles an hour is not infrequent.
- Precipitation is mainly in the form of snow, falling in winter.
- Snowfall varies with locality.
- Convectional rainfall is generally absent-because of the low rate of evaporation and the lack of moisture in the cold polar air.

Natural Vegetation

- In such an adverse environment as the tundra, few plants survive.
- The greatest inhibiting factor is the region's deficiency in heat.
- There are no trees in the tundra.
- Such an environment can support only the lowest form of vegetation, mosses, lichens and sedges.

Economy

- Human activities of the tundra are largely confined to the coast.
- The few people who live in the tundra live a semi-nomadic life.
- In Greenland, northern Canada and Alaska live the Eskimos.
- They used to live as hunters, fishers and food-gatherers.
- During winter they live in compact igloos and in summer when they move out to hunt they pitch portable tents of skins by the side of stream.
- Their food is derived from fish, seals, walruses and polar bears.

- In the Eurasian tundra are other nomadic tribes such as the Lapps of northern Finland and Scandinavia, the Samoyeds of Siberia, Yakuts, Koryaks and Chuckchi of northeastern Asia.



THE OCEANS

Oceans



While there is only one global ocean, the vast body of water that covers 71 percent of the Earth is geographically divided into distinct named regions. The boundaries between these regions have evolved over time for a variety of historical, cultural, geographical, and scientific reasons. Historically, there are four named oceans: the Atlantic, Pacific, Indian, and Arctic. However, a new ocean has now been recognized as the **Southern (Antarctic) as the fifth ocean**. The Pacific, Atlantic, and Indian are known as the three major oceans.

- They are source of food- fish, mammals, reptiles, salt and other marine foodstuffs.
- The tides can be harnessed to provide power.
- Oceanography is the branch of science that deals with the physical and biological properties and phenomena of the sea.
- Earlier echo-sounding techniques were used, now **radar soundings** and electrical echo devices are used to find the precise depths of ocean floors and map the relief of oceans.

The Relief of the Ocean

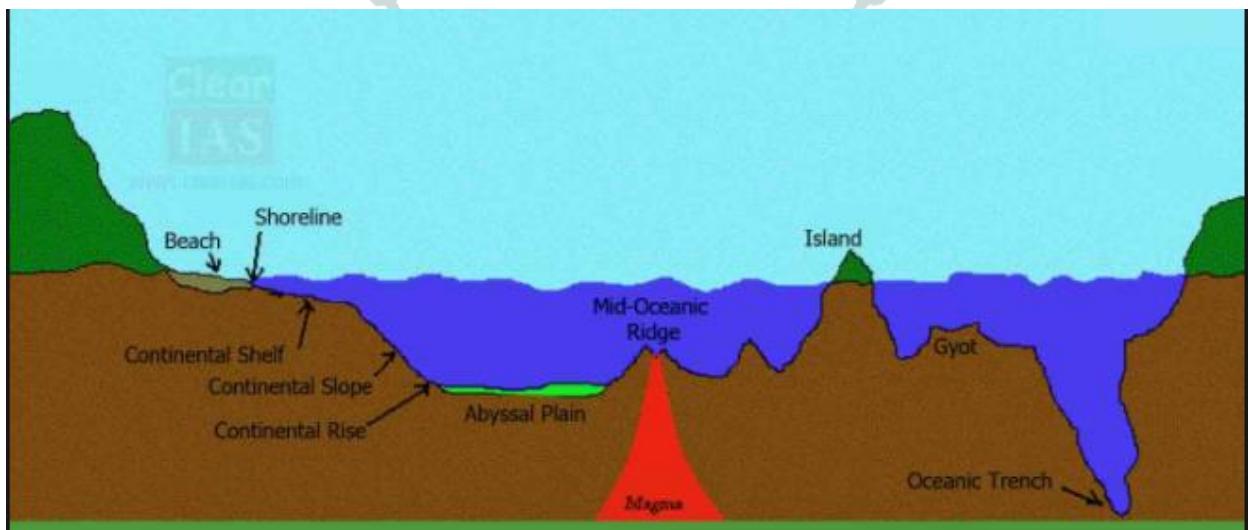
The oceans, unlike the continents, merge so naturally into one another that it is hard to demarcate them. The geographers have divided the oceanic part of the earth into five oceans, namely the Pacific, the Atlantic, the Indian, Southern and the Arctic. The various seas, bays, gulfs and other inlets are parts of these four large oceans. A major portion of the ocean floor is found between 3-6 km below the sea level. The 'land' under the waters of the oceans, that is, the ocean floor exhibits complex and varied features as those observed over the land. The floors of the oceans are rugged with the world's largest mountain ranges, deepest trenches and the largest plains. These features are formed, like those of the continents, by the factors of tectonic, volcanic and depositional processes.

Divisions of the Ocean Floors

The ocean floors can be divided into four major divisions:

- the Continental Shelf
- the Continental Slope
- the Deep Sea Plain
- the Oceanic Deeps.

Besides, these divisions there are also major and minor relief features in the ocean floors like ridges, hills, seamounts, guyots, trenches, canyons, etc.



The Continental Shelf

- The continental shelf is the extended margin of each continent occupied by relatively shallow seas and gulfs. It is the shallowest part of the ocean showing an average gradient of 1° or even less.
- The shelf typically ends at a very steep slope, called the shelf break.
- The width of the continental shelves vary from one ocean to another. The average width of continental shelves is about 80 km.
- The shelves are almost absent or very narrow along some of the margins like the coasts of Chile, the west coast of Sumatra, etc. On the contrary, the Siberian shelf in the Arctic Ocean, the largest in the world, stretches to 1,500 km in width.
- The depth of the shelves also varies. It may be as shallow as 30 m in some areas while in some areas it is as deep as 600 m.
- The continental shelves are covered with variable thicknesses of sediments brought down by rivers, glaciers, wind, from the land and distributed by waves and currents. Massive sedimentary deposits received over a long time by the continent shelves, become the source of fossil fuels.
- There are 3 views on continental shelf –
 - They can be part of continent submerged due to rise in sea level.
 - Some smaller continental shelves could have been caused by wave erosion.
 - They may have been formed by the deposition of lands derived or river borne materials on the off-shore terrace

Continental shelf geographical significance –

- Their shallowness enables sunlight to penetrate through the water, which encourages the growth of plants and organism → now rich in plankton → fishes thrive on them → so continental shelves are richest fishing grounds.
- E.g. – Grand banks off Newfoundland, the North Sea and the Sunda shelf.
- Their limited depth and gentle slope keep out cold under-currents and increase the height of tide. This sometimes hinders shipping and other marine activities since ships can only enter and leave port on the tide.
- Ports like Southampton, London, Hamburg, Rotterdam, Hong Kong and Singapore are located on continental shelves.

Continental Slope

- The continental slope connects the continental shelf and the ocean basins. It begins where the bottom of the continental shelf sharply drops off into a steep slope.
- The gradient of the slope region varies between 2-5°.
- The depth of the slope region varies between 200 and 3,000 m. The slope boundary indicates the end of the continents. Canyons and trenches are observed in this region.

The Deep-Sea Plain

- An abyssal plain is an underwater plain on the deep ocean floor
- Found at depths - between 3,000 metres and 6,000 metres.
- Lying generally between the foot of a continental rise and a mid-ocean ridge, abyssal plains cover more than 50% of the Earth's surface.
- It has extensive submarine plateaus, ridges, trenches, beams, and oceanic islands that rise above sea level in the midst of oceans.
- E.g. the Azores, Ascension Island

The Ocean Deeps or Trenches

- **Ocean trenches** are steep depressions in the deepest parts of the ocean [where old ocean crust from one tectonic plate is pushed beneath another plate, raising mountains, causing earthquakes, and forming volcanoes on the seafloor and on land]
- **Most of trenches are located near continents.**
- Greatest ocean deep – **Mariana Trench** near Guam Island (36000 feet deep). This shows that oceanic trenches are greater than highest mountain land on earth.
- Other ocean deeps –
 - Mindanao deep (35000 feet)
 - Tonga trench (31000 feet)
 - Japanese trench (28000 feet) (all 3 in Pacific Ocean)

The Oceanic Deposits of the Ocean floor

- We have read that rivers erode and deposit some materials in flood plains and drop sediments like sand, silt in sea.
- Slow sedimentation – in this process eroded particles are filtered slowly and settled on one another in layers. Oceanic deposits can be classified on different basis:

On the basis of Origin

- Terrigenous deposits: These are the deposits which originated on terrestrial surface and were transported to oceans through wind and water. They contain both organic and inorganic matter. The thickness of terrigenous deposits is highest on continental shelf and slope.
- Hydrogenous deposits: They originate in water. They include both organic and inorganic particles. Most of the organic materials are derived from dead plant and animals. Inorganic particles contain precipitated salts.
- Cosmic deposits: They are extra-terrestrial. They are less than 1% of total deposits and uniformly distributed on the abyssal plain. Some of them are thin glassy particles called tektites.

The oozes- The biological deposits of oceans are called Oozes.

- Pelagic deposits – fine-grained sediment that accumulates as the result of the settling of particles to the floor of the open ocean, far from land.
- Made of - shelly and skeletal remains of marine organism
- They have very fine, flour like texture and occur as accumulated deposits or float about in suspension.

They can be of two types –

- Calcareous Oozes – They have high quantity of calcium. They are found up to the depth of 2500m.
- Silicious Oozes – They have high quantity of silicon and found beyond 2500 m.

The clays

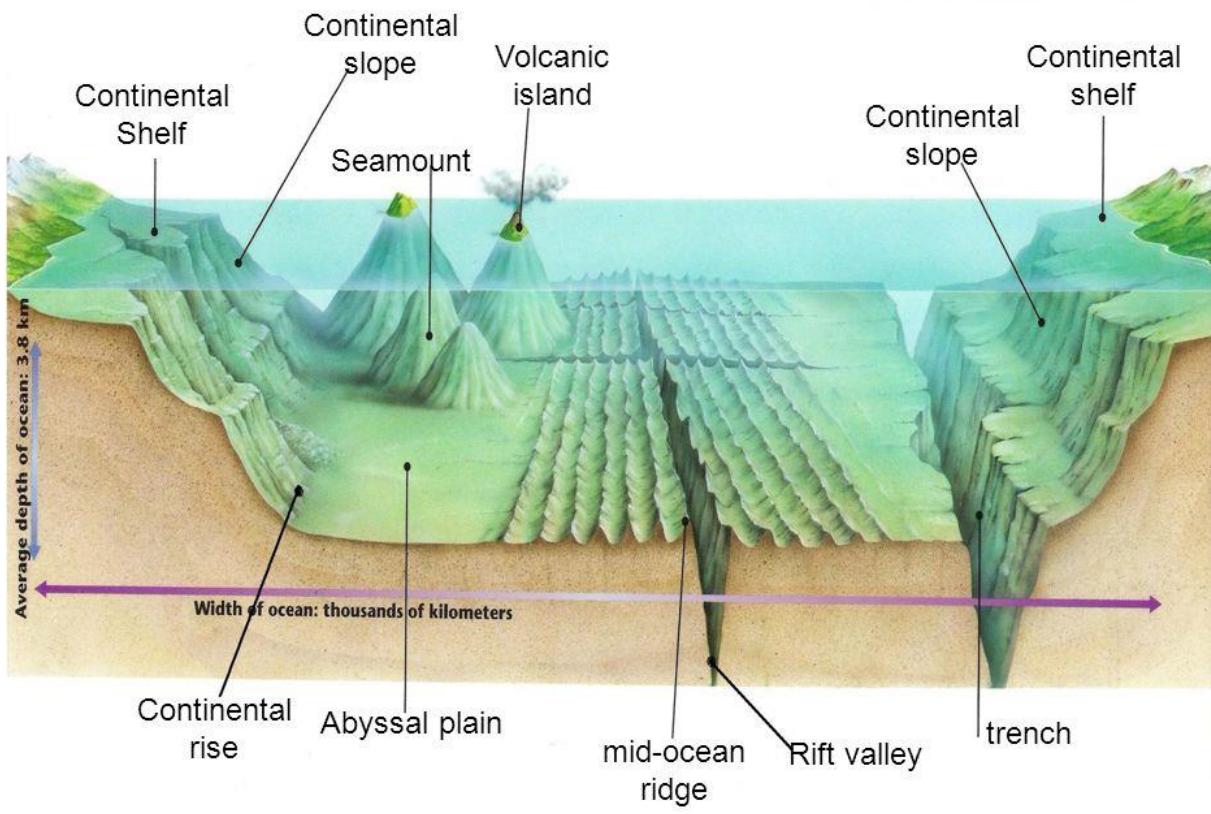
They are one of the finest deposits found on the ocean floor.

- Occur as red clay in deep oceanic basin. (abundant in Pacific Ocean)
- These are believed as volcanic dust blown out from volcanoes during volcanic eruptions.

Minor Relief Features

Apart from the above mentioned major relief features of the ocean floor, some minor but significant features predominate in different parts of the oceans.

The Ocean Floor



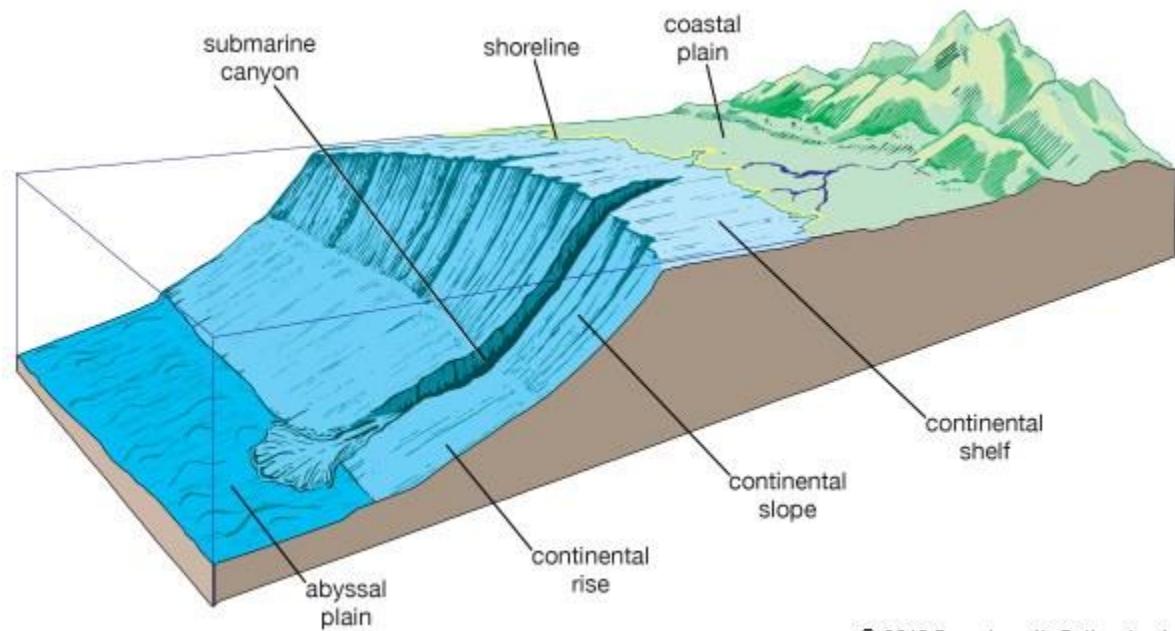
Mid-Oceanic Ridges

- A mid-oceanic ridge is composed of two chains of mountains separated by a large depression. The mountain ranges can have peaks as high as 2,500 m and some even reach above the ocean's surface. Iceland, a part of the mid-Atlantic Ridge, is an example.

Seamount

- It is a mountain with pointed summits, rising from the seafloor that does not reach the surface of the ocean. Seamounts are volcanic in origin. These can be 3,000-4,500 m tall. The Emperor seamount, an extension of the Hawaiian Islands in the Pacific Ocean, is a good example.

Submarine Canyons



- These are deep valleys, some comparable to the Grand Canyon of the Colorado River. They are sometimes found cutting across the continental shelves and slopes, often extending from the mouths of large rivers. The Hudson Canyon is the best known submarine canyon in the world.

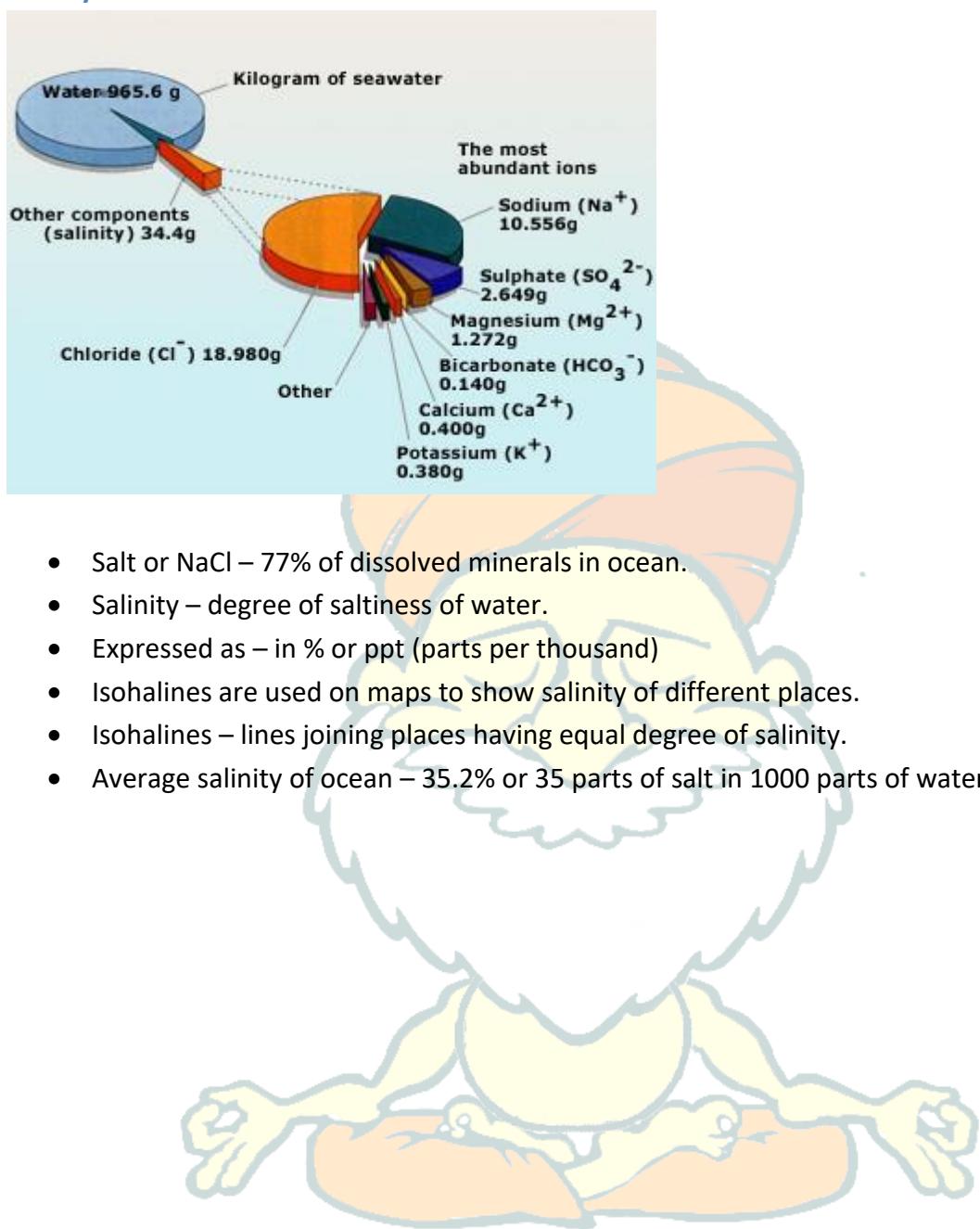
Guyots

- It is a flat topped seamount. They show evidences of gradual subsidence through stages to become flat topped submerged mountains. It is estimated that more than 10,000 seamounts and guyots exist in the Pacific Ocean alone.

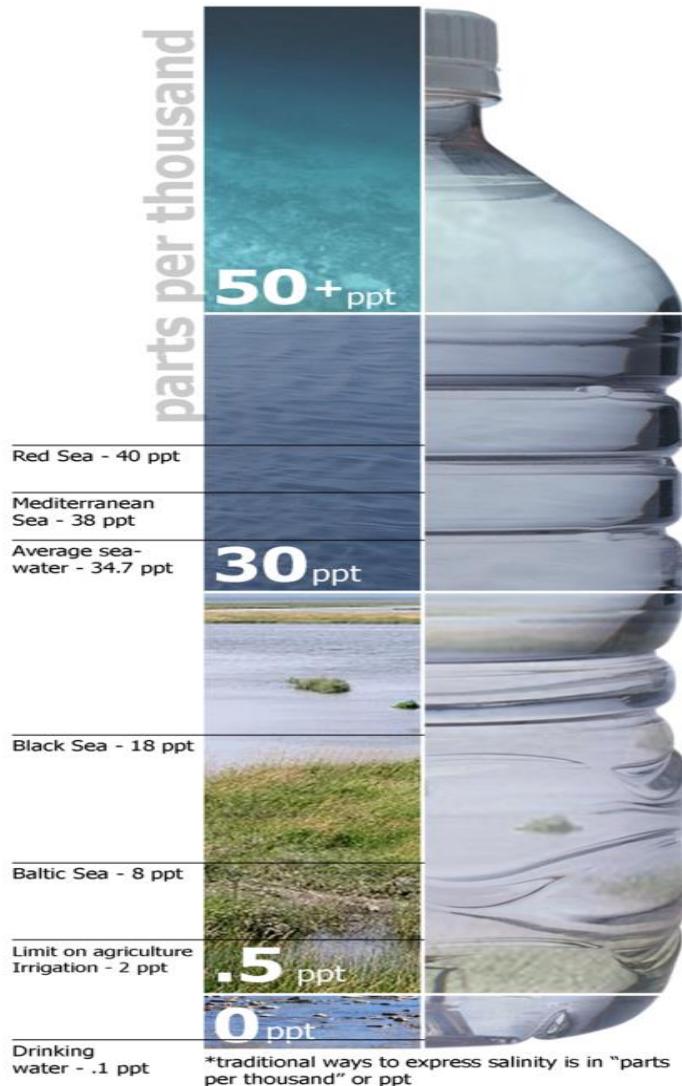
Atoll

- These are low islands found in the tropical oceans consisting of coral reefs surrounding a central depression. It may be a part of the sea (lagoon), or sometimes form enclosing a body of fresh, brackish, or highly saline water.

Salinity of the Ocean



- Salt or NaCl – 77% of dissolved minerals in ocean.
- Salinity – degree of saltiness of water.
- Expressed as – in % or ppt (parts per thousand)
- Isohalines are used on maps to show salinity of different places.
- Isohalines – lines joining places having equal degree of salinity.
- Average salinity of ocean – 35.2% or 35 parts of salt in 1000 parts of water.



briny water
brine pools
50+ ppt

saline water
seawater, salt lakes
30-50 ppt

brackish water
estuaries, mangrove swamps,
brackish seas and lake, brackish
swamps
.5-30 ppt

fresh water
ponds, lakes, rivers, streams,
aquifers
0-.5 ppt

The salinity of the Great Salt Lake , (Utah, USA), the Dead Sea and the Lake Van in Turkey is 220, 240 and 330 respectively. The oceans and salt lakes are becoming more salty as time goes on because the rivers dump more salt into them, while fresh water is lost due to evaporation.

Factors affecting Salinity of Ocean

There are parts of the ocean where hardly any rain falls but warm dry winds cause lots of evaporation. This evaporation removes water- when water vapor rises into the atmosphere, it leaves the salt behind, so the salinity of the seawater increases. This causes the seawater to become denser. The north and south Atlantic have high salinity – these are areas where there are strong winds and not much rain.

The Mediterranean Sea in Europe has very high salinity – 38ppt or more. It is almost closed from the main ocean, and there is more evaporation than there is rain or extra freshwater added from rivers.

Rate of evaporation

- Compare to the temperate latitude ocean, the ocean between 20°N and 30°N latitudes has higher salinity because of higher rate of evaporation (because of high temperature).
- But this doesn't mean that tropical oceans will have higher salinity because of points mentioned in next point.

The amount of fresh water added by precipitation, streams and icebergs

- The places having high daily rainfall, high relative humidity and addition by fresh water have low salinity.
- E.g. Oceans into which huge rivers like Amazon, Congo, Ganges, Irrawaddy and Mekong drain have lower salinity.
- The Baltic, Arctic and Antarctic waters have a salinity of <32 ppt because much fresh water is added from the melting of icebergs, as well as by several large poleward bound rivers.

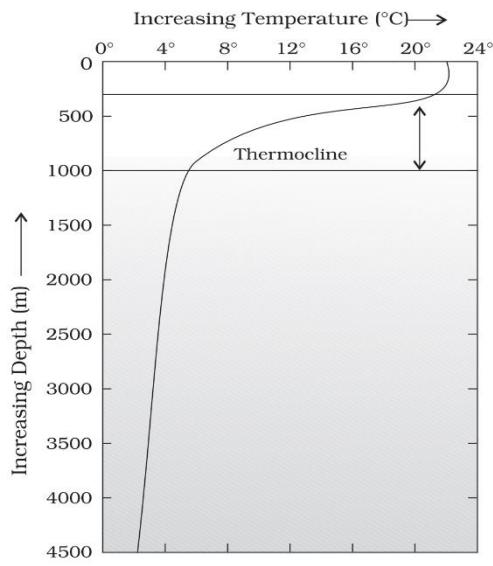
The degree of water mixing by currents

- Regions which are land-locked (enclosed by lands) have higher salinity because no mixing of fresh water + continuous evaporation. E.g. – Black sea, Caspian Sea, red sea, Persian Gulf
- The range of salinity is negligible where there is free mixing of water by surface and sub-surface currents

| Sea | Salinity (in ppt) |
|-------------|-------------------|
| Baltic Sea | 7 |
| Red sea | 39 |
| Caspian Sea | 180 |
| Dead Sea | 250 |
| Lake Van | 330 |

The Temperature of Ocean Water

- Water warms up and cools faster than land and so ocean's annual range of temperature is small.
- For open seas it is -ve 12°C ($<10^{\circ}\text{F}$)
- It decreases from equator (21°C) towards 45° latitude N and S (12°C) and freezes at poles.
- But it didn't remain constant with latitude because depends on many factors like warm and cold currents, winds and air masses.



- **Temperature-depth profile** for the ocean water shows how the temperature decreases with the increasing depth. The profile shows a boundary region between the surface waters of the ocean and the deeper layers.
- The boundary usually begins around 100 - 400 m below the sea surface and extends several hundreds of meters downward (see image). This boundary region, from where there is a rapid decrease of temperature, is called the **thermocline**.

Important Note: Kindly note that we will be providing a revision document on Ocean Current and concepts in Geography well before the Prelims. It will help you remember the exam oriented facts and concepts.

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