

Chapter 2 "Climate"

Weather: It refers to daily changes in atmospheric conditions (temperature , rainfall ,humidity and pressure) for a short period of time locally

Climate : The generalization of day to day weather conditions of a particular area/region over a long period of time (33years)

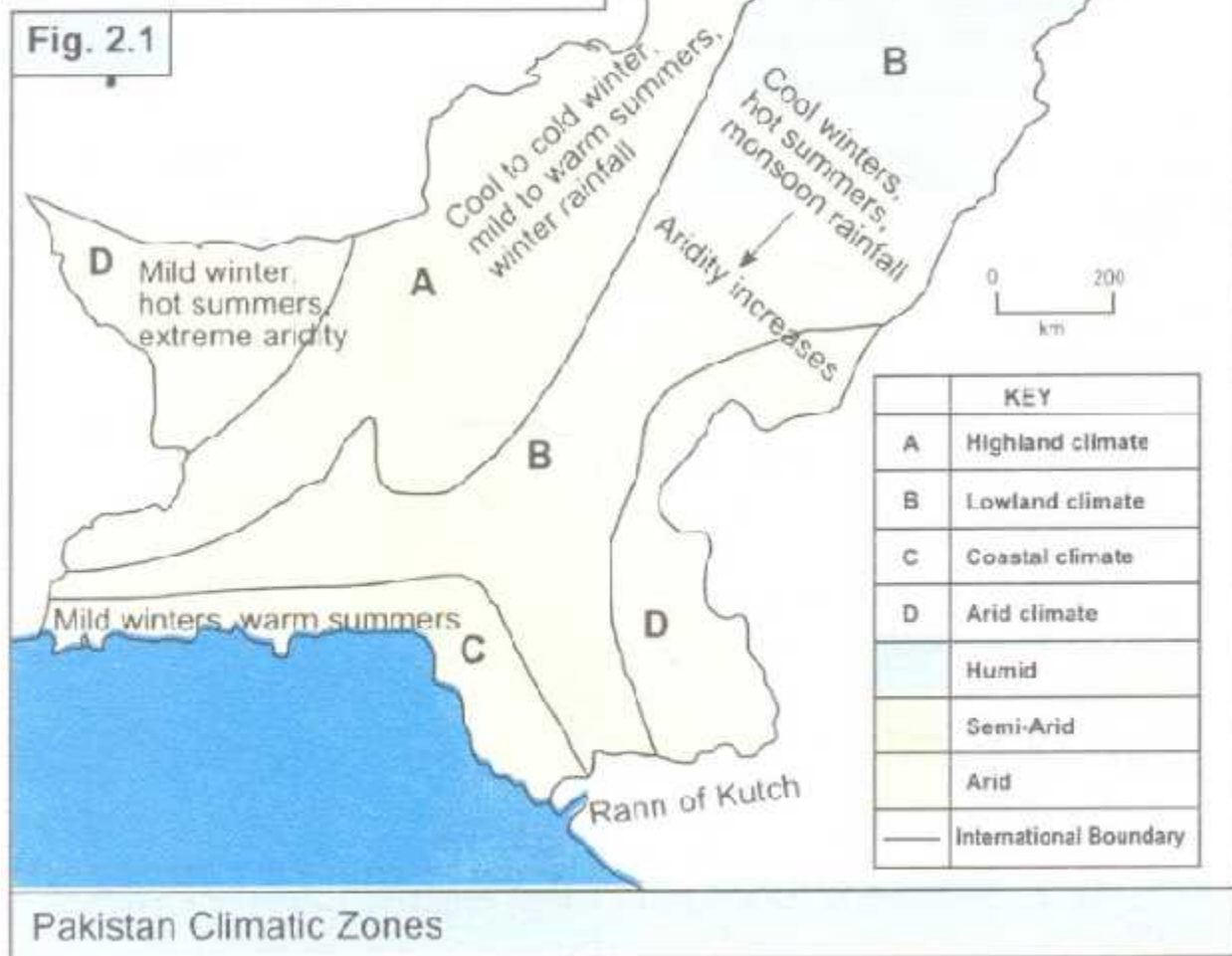
Pakistan is divided into four climatic zones with respect to altitude

1. Highland climate
2. Lowland climate
3. Arid climate
4. Coastal climate

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the Indus Plain. Zone C has coastal climate experienced by the Makran Coast, Karachi Coast and Indus Delta till the Rann of Kutch. Zone D has arid climate



Features of Highland climate

It includes Northern, north western and western highlands of Pakistan (Kashmir, Gilgit, KPK, and Balochistan)



Rainfall and temperature depends on altitude the higher the altitude lower the temperature and higher the rainfall
Northern Mountains range from 2000 to 8000 m having cold winters mild summers and rainfall in all seasons
Western mountains range from 1000 to 4000 m having cool to cold summer ,mild to warm winters and rainfall in winters only
Summers are short mild and wet in Northern mountains but dry in western mountains



Features of Lowland Climate

It includes the whole upper and lower indus plain excluding coastal areas
Mostly consist of arid and extreme climate with hot summers cool winters and summer monsoon rainfall
Rainfall increases from south to north
Also receives rainfall from western depression



Comparatively most irrigated and fertile land of Pakistan lies under upper indus plain
Continental effect drives the climate



Features of Coastal climate

It includes southern coastal strip Indus delta Karachi and the whole of makran coast

Sea breezes dominates the climate throughout the year and keeps it moderate

Meritime effect dominates the climate

Humidity level is mostly high reaching 50% in April to September

Mean monthly temperature is 32 % May June are hottest months

Rainfall is less and scanty mostly during monsoon season





Features of Arid Climate

It includes south western desert of balochistan (Kharan)& South eastern desert of Sindh (Tharparkar)

Dominated by dry and hot climate throughout the year

Hot Dusty wind prevails from may to September

Low amount Scanty rainfall during winters in balochistan

Summer monsoon brings little rainfall in Sindh

Extreme heat dryness and dust storms are common



There are four climatic elements responsible for seasonal variations in the climate of Pakistan

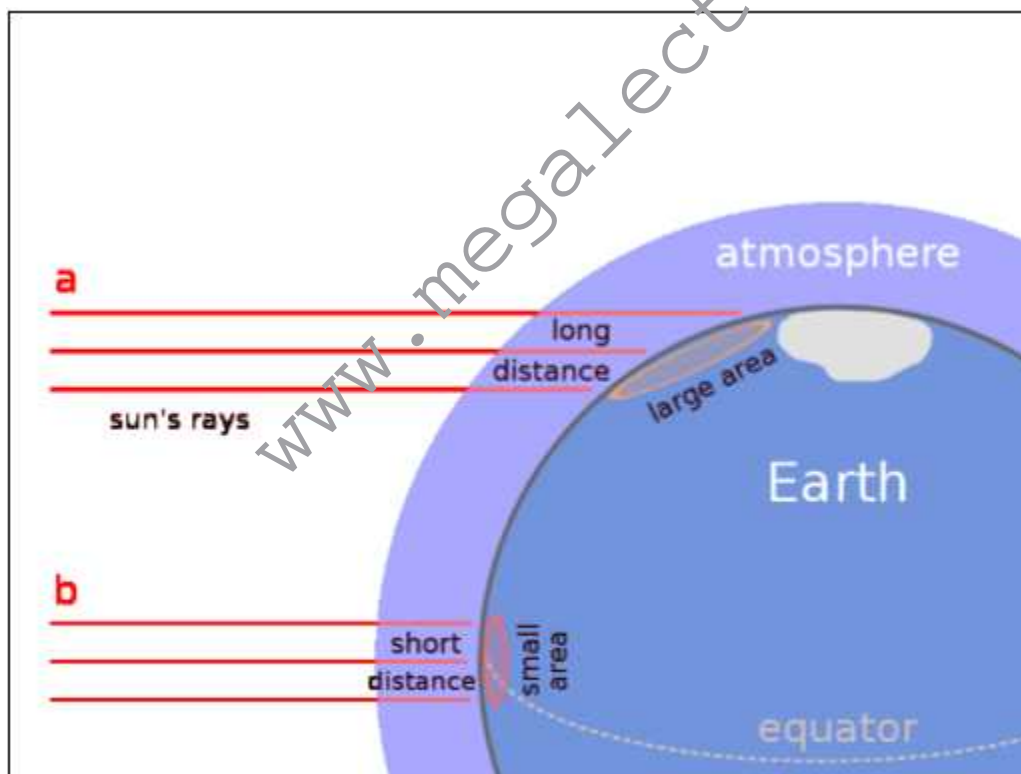
- Temperature
- Rainfall
- Pressure
- Winds

Factors effecting temperature of Pakistan

1. Angle of Sun and Latitudinal effect

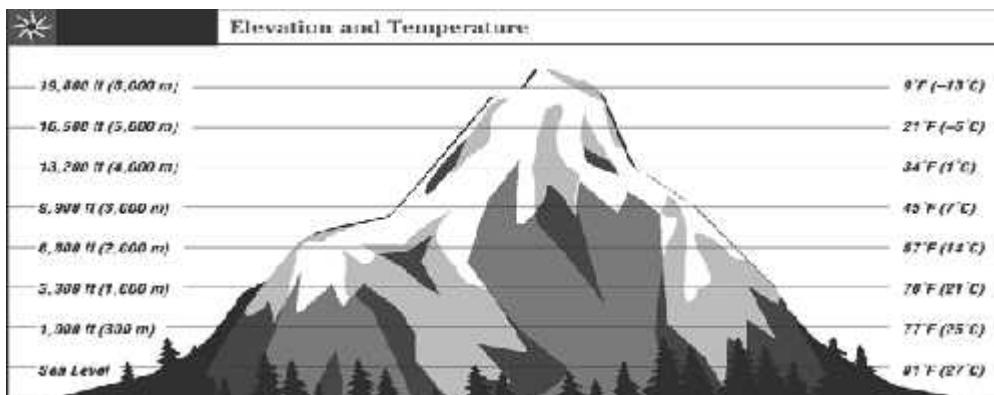
Temperature and rainfall are both dependent either directly or indirectly on the influence of the sun. The sun's influence varies from place to place due to factors like angle of sun at a particular place

As it is evident the Polar Regions or regions far away from the Equator are generally cooler than the ones nearer the Equator. This is because for solar radiation to reach the poles and heat them it has to travel a larger distance in space, thus it loses its intensity (energy). Also near the poles the radiation arrives at an oblique angle so solar energy spreads over a large area. Since Pakistan lies in subtropical areas it does receive most of intense solar radiation concentrated on a small area thus the temperature in general is warmer. So in general terms Faisalabad will be cooler than say Hyderabad



2. Altitude and temperature

The temperature is highly dependent on altitude, air density and temperature. The air is densest at sea level due to water vapour, dust particles and solar radiation and least dense at high altitude because of less solar radiation is absorbed with less air to absorb heat. There is an average drop of 6.5 C in temperature for each 1000 metre increase in altitude.

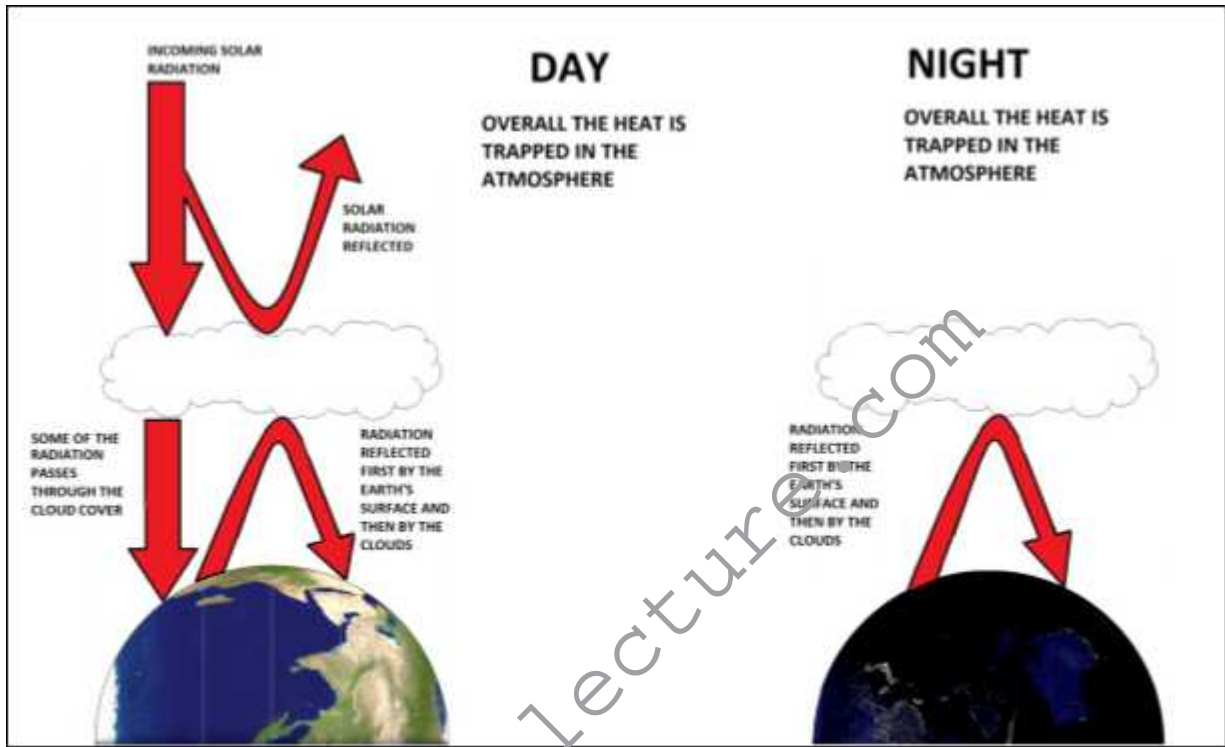


3. Cloud cover and Temperature

Temperatures decrease when clouds appear and block out the Sun's rays, which are then reflected back into space. However cloud

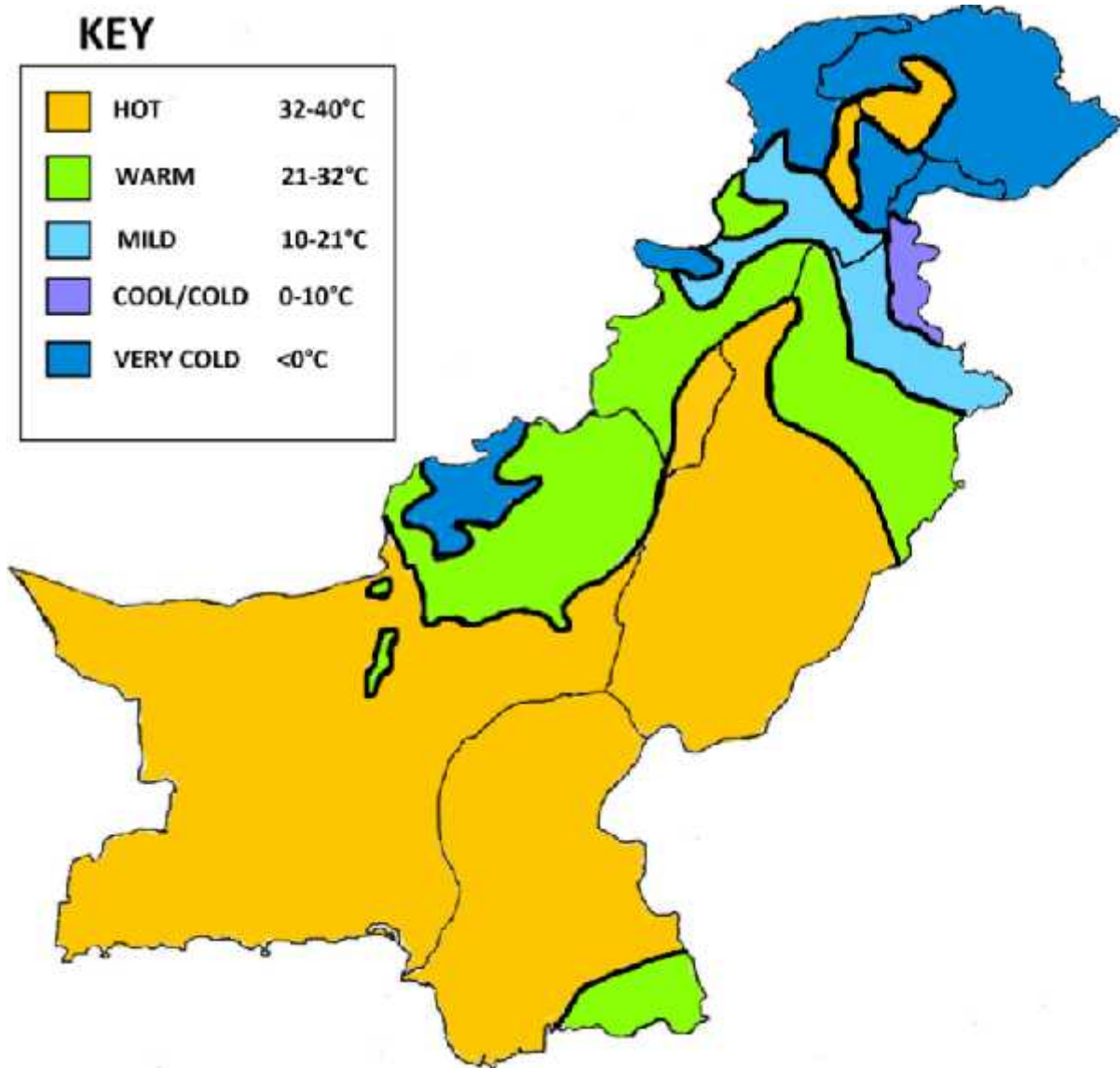


formation only takes place when air contains sufficient moisture and has been sufficiently cooled. Thus cloudy days are much cooler than sunny days during the same months.



4. Continental effect:

It refers to all those areas having distance from the sea (interior region) hence does not get maritime influence of the sea on temperature therefore the temperature is never moderate hence extreme winters and summers are recorded.



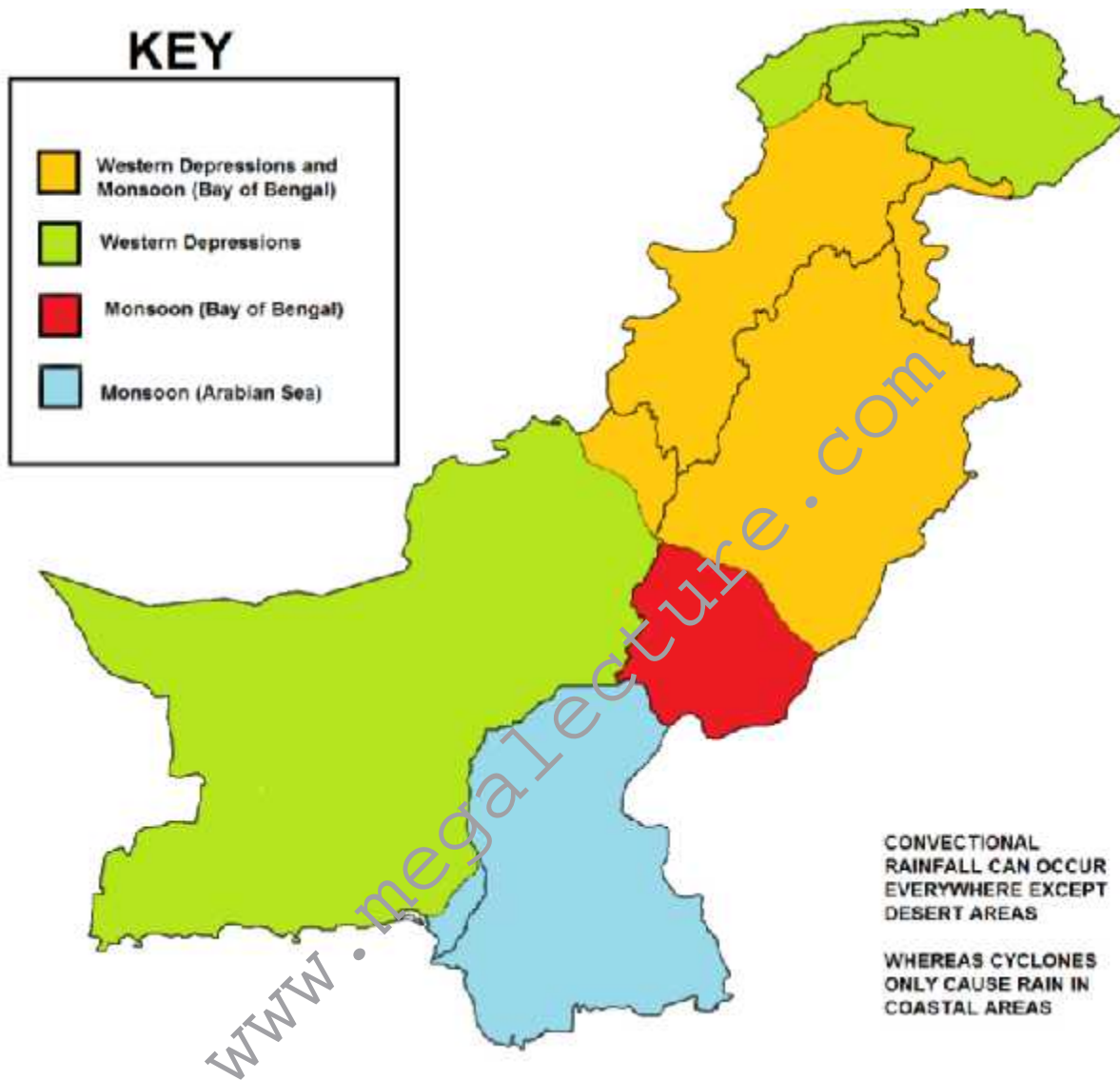
Rainfall

Sources of rainfall in Pakistan :

- I. Monsoon Winds
- II. The Western Depression
- III. Convectional Currents



- IV. Relief rainfall
- V. Tropical Cyclones



Monsoon Rainfall

Monsoons are seasonal winds that blow from sea towards land from July to August (summers). After it they reverse their direction and blow from land towards the sea (winters).

. There are two monsoon systems, one originating from the Bay of Bengal and other from the Arabian Sea. Moist laden winds from high



pressure areas of sea blow towards land. From the east the monsoon clouds are deflected along the Himalayas from Nepal to Pakistan. Along the way these clouds rise, cool and thus condense eventually bringing rainfall to Pakistan. They affect northern Punjab, Khyber-Pakhtunkhwa, Gilgit-Baltistan and Azad Kashmir

On the other hand another monsoon system that originates in Arabian Sea also travels inland and delivers little rainfall to Sindh



The Western Depression

These are wind systems that originate from the Mediterranean Sea and travel eastwards towards Afghanistan and Pakistan. Since they make a long journey they lose most of their water when they reach Pakistan. During the winters (Late November to March) they bring rainfall because during winters the Arabian Sea retains its warmth and thus cold air from coastal areas flows towards sea. these western

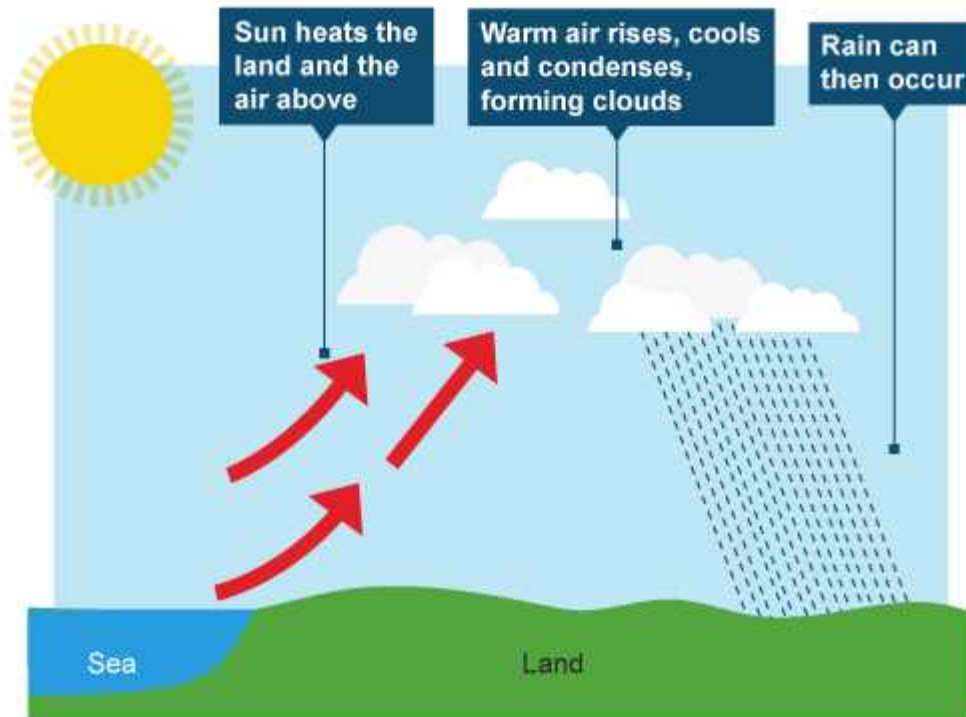


depressions move from high pressure area (Mediterranean Sea) towards the low pressure area (Indus Plains)



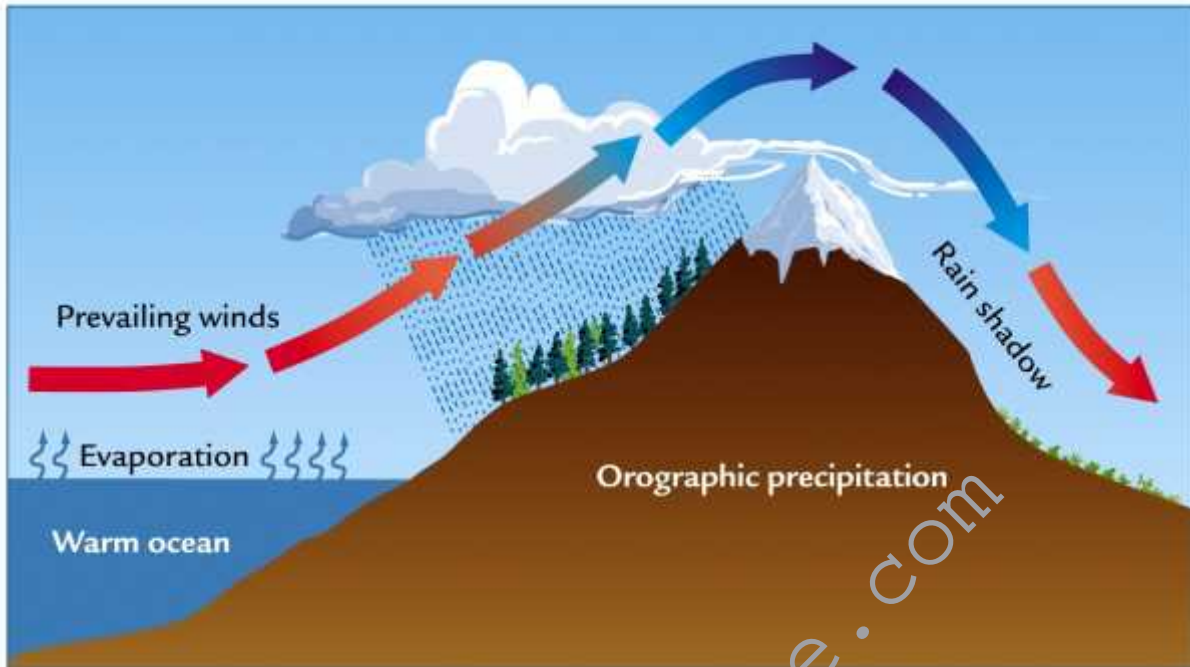
Convection

Convection rainfall occurs when the sun heats up the land. The air near the land absorbs heat by conduction, and thus gets less dense and rises. The moisture in air condenses to form clouds, and when this air is cooled to a certain minimum level rainfall occurs



Relief Rainfall

Relief or orographic **rain** is formed when air is forced to cool when it rises over **relief** features in the landscape such as hills or mountains. As it rises the chilling causes condensation and precipitation on the windward side and forms **rain**. **The leeward side becomes rainshadow**

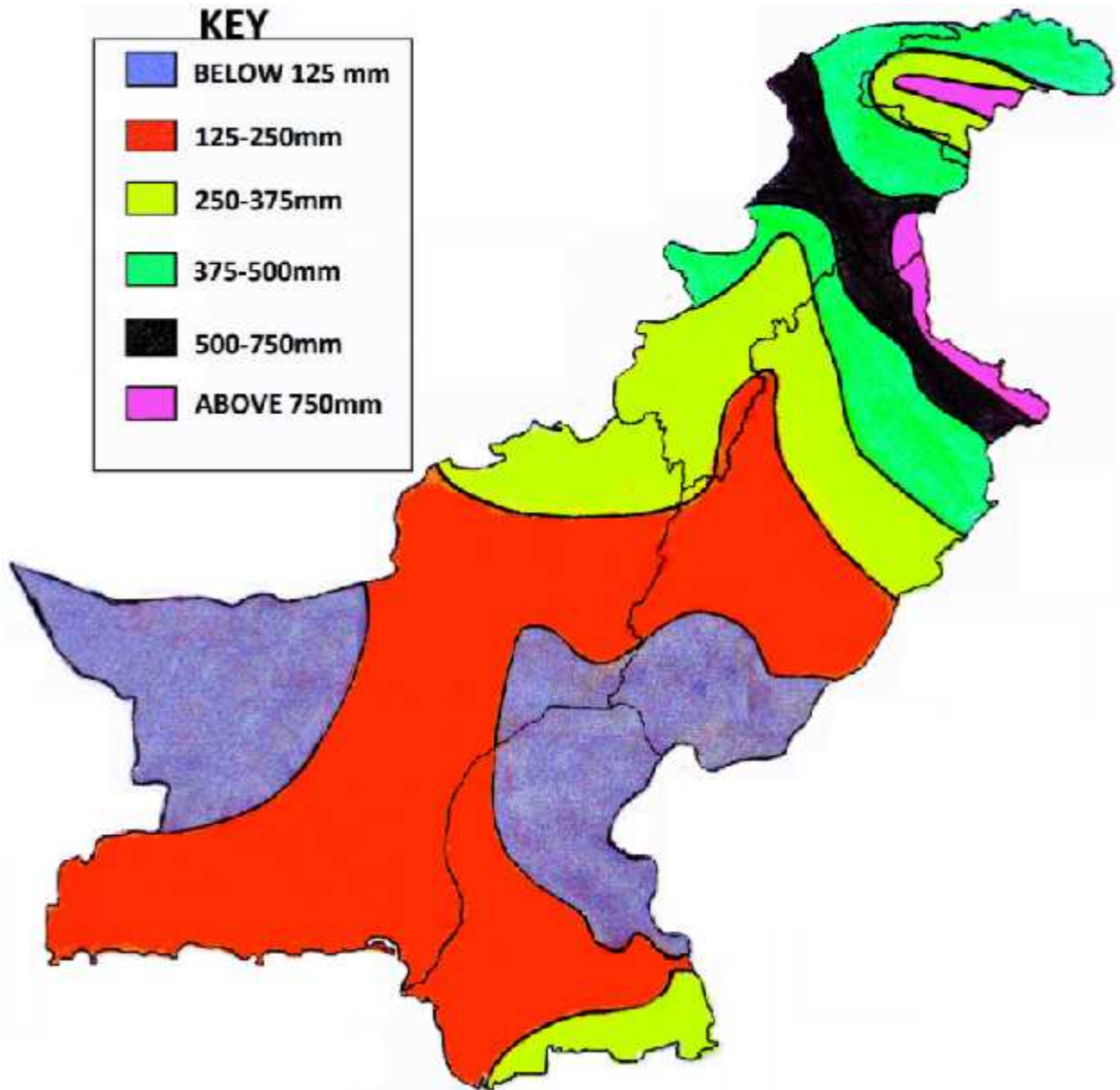


Thunderstorm

Thunderstorms occur in the same fashion as convectional rainfall with the main difference being that the air here rises very quickly forming Cumulonimbus clouds, which are very tall and big. This is followed by strong winds, lightning and heavy rainfall. Hailstones may also be formed, when the water vapours are cooled multiple times (to form water first and then ice).

Cyclone

Cyclones are formed when the average temperature of large water body exceeds 27°C , thus forming an area of very low pressure. This area then draws further air from high pressure areas quickly. A cone is formed when two oppositely travelling cold and warm winds meet. Intense lightning followed by very strong winds and heavy rainfall occurs. Their effects are similar to that of floods



CLIMATIC HAZARDS



I. Floods

Flood is a temporary covering of land by water which is dry. They can be caused by variety of factors like

Heavy monsoon rainfall accompanied with melting of snow and ice in glaciers causing excess of water in rivers, dam or barrage failure, unusually high tides in coastal areas and by a tsunami

The indus tributaries overflow almost every year but only sometimes the flood risk is serious.



Floods can also be caused by following human reasons

Deforestation

failure to heighten or strengthen embankments

poor medical and communication facilities in aftermath of disaster

inadequate warning systems to allow people time for escape



Benefits of flood

restoring underground water supplies,
filling reservoirs of dam
makes the soil fertile by alluvium deposits
increases fish production in the sea and land

Reducing Effects of Floods

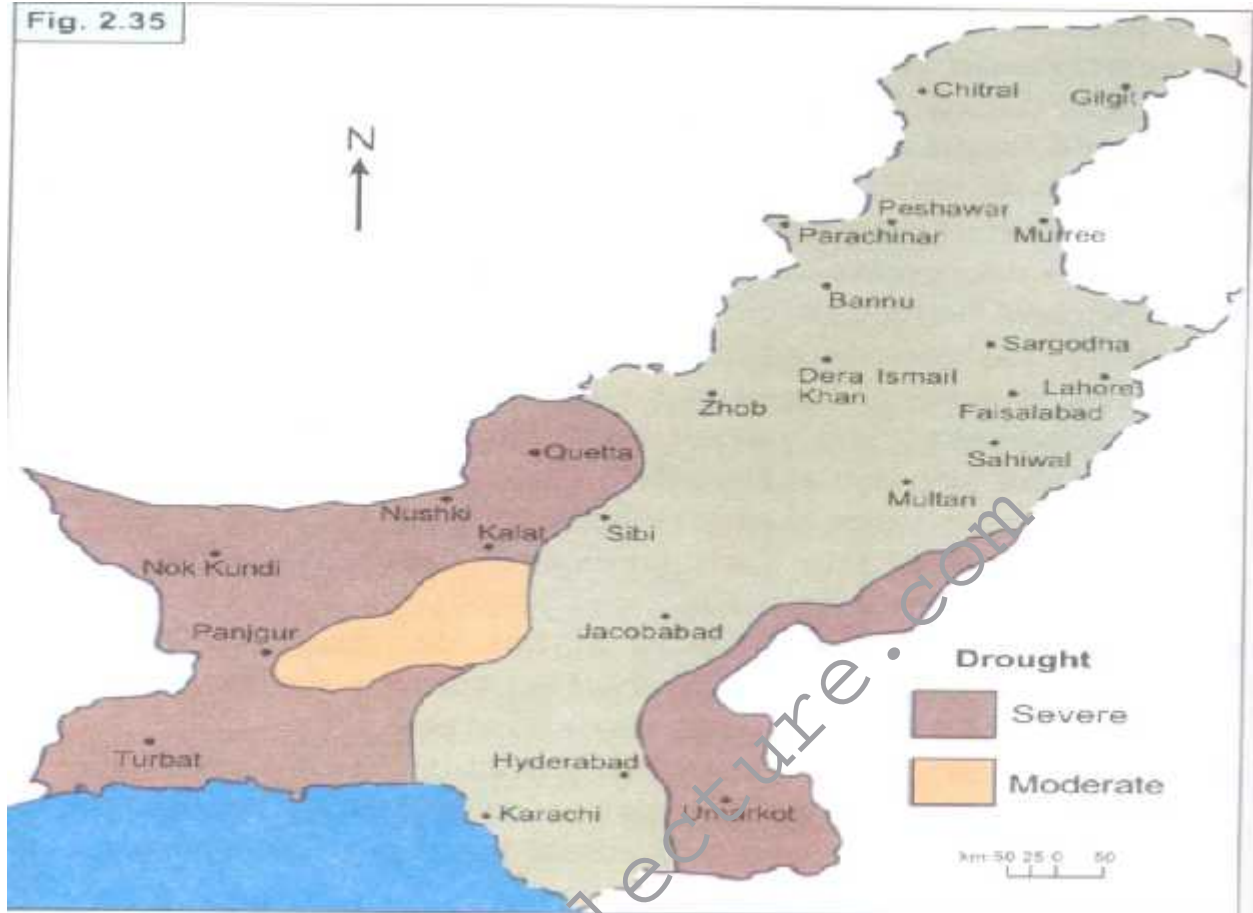
Dams could be built to contain and regulate the flow of water and prevent flash floods 🤔

Advanced warning systems should be installed in flood prone areas to warn people to get out before it's too late

Medical and transport facilities be regularly updated and checked
Embankments and levees should be heightened and strengthened
afforestation and reforestation projects should be carried out in Northern Mountains to reduce run-off and thus reducing chances of flash floods

Droughts





There are four types of droughts

Permanent drought

Occurs when crop cultivation is highly dependent on irrigation only

Seasonal drought

Occurs when rainy areas faces dry seasons for longer period than usual

Invisible drought

Occurs when water deficiency reduces crop yield but does not destroy them

Unpredictable drought



Caused by abnormally low rainfall in areas of humid climate



Effects

Crop yields can be dramatically reduced and livestock production could fall (milk, eat etc). This can raise prices of goods and affect price of exported goods making them uncompetitive in international markets thus harming national interests

Dust storms can occur, when drought hits an area suffering from desertification and erosion. This can lead to siltation in reservoirs of dam, hampering electricity generation and weakening dam's foundation

Habitat damage, affecting both terrestrial and aquatic wildlife

Malnutrition, dehydration and related diseases could affect millions

Mass migration causing the increase in internal refugees or international refugees



Reduced electricity production could occur as reduced water flow through hydroelectric dams leads to low industrial production and less exports resulting in less foreign exchange
Shortages of water for industries like (juice etc), which affects employment and GDP

Social unrest may follow leading to instability, which can discourage foreign investment thus local sectors may suffer from outdated machinery techniques etc resulting in low production

War could occur over natural resources, including lakes and fertile areas etc

Wildfires can become common and can cause health hazard to people

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