

Climate

Definitions

- **Climate** is a generalization of the day to day weather conditions over a long period of time, usually over 30 years.
- **Weather** refers to the atmospheric conditions e.g. temperature, humidity, rainfall and pressure of any place for a short period of time. It is often localized.
- **Humidity** is the amount of water vapor present in air.
- **Condensation** is the conversion of water vapors into liquid due to which clouds are formed.

Temperature key

- 40°C and above (very hot)
- 31°C - 39°C (hot)
- 21°C - 30°C (warm)
- 10°C - 20°C (mild)
- 03°C - 09°C (cool)
- -5°C - 02°C (cold)
- Below -5°C (very cold)

Climate zones

- Highland climate
- Lowland climate (semi – arid)
- Coastal climate (humid)
- Arid climate (arid)

Highland climate

Northern mountains

- Cold/very cold winters
- Mild summers.
- Rainfall in all seasons (mainly in the form of snow in winter)
- Large daily range

Western mountains

- Cold winters
- Warm summers
- Winter rainfall/western depression

- Large daily range

Semi – arid/lowland climate (UIP + LIP + Potowar Plateau)

- Cool/cold winters
- Hot summers
- They receive high monsoon rainfall
- Dryness/aridity increases from north to south
- Large daily range

Humid/coastal climate

Karachi coast

- Mild winters
- Warm summers
- Monsoon rainfall (Arabian sea)
- Tropical cyclones
- Short daily range

Makran coast

- Mild winters
- Warm summers
- Rainfall from winter depressions (from Iran)
- Tropical cyclones
- Short daily range

Arid climate (Deserts e.g. Thar and Kharan)

- Mild winters
- Hot/very hot summers
- Extreme aridity due to little rainfall
- Large daily range
- Dust storms

Factors influencing temperature

- Latitude
- Altitude

- Distance from sea

Latitude/angle of sun

- Temperatures are very high near the equator
- As we move down/up the equator towards the north or south pole, temperature decreases
- This is because rays spread over a larger area due to the low angle of the sun

Altitude/height of land

- As height increases, temperature decreases
- ... As air is less dense so holds less heat
- Heat radiated from the surface decreases from height
- Fall of 5°C for every 500m in height in dry or arid air like of Pakistan

Distance from sea

Maritime influence (sea)

- Climate influenced by sea giving low range of temperature between summer and winter
- Places near coast are cooled by sea in summer and warmed by it in winter as water absorbs and releases heat slowly

Conditional influence (land)

- Land is not under sea influence i.e. are too far from sea
- In these inland areas, temperature is high in summer as land heats up rapidly
- But in winter, land gives off heat rapidly and so locations experience colder winters

Sources of rainfall in Pakistan

- Monsoon winds
- Western depression
- Convectional currents (causing thunderstorm)
- Tropical cyclones
- Relief

Monsoon winds

- Moisture bearing winds carrying rain
- Blow from Bay of Bengal and move from East to West
- After crossing Bangladesh and northern India, the tail end of the winds enter northern Pakistan
- Across UIP towards northern areas
- ... due to low pressure there
- Rise over land
- Moisture condenses
- So clouds are formed therefore heavy rainfall
- Some monsoon winds blow across south – east Pakistan from the Arabian Sea
- These are weak winds and have little effect
- However, sometimes an over – active monsoon system brings heavy monsoon rainfall in Karachi

Causes of monsoon at Karachi

- Low pressure develops over land
- Draws in wind from high pressure are:-
 - From the Arabian Sea
- Moisture bearing/wet winds carrying rain/humid
- Rise over land
- Cools
- Moisture condenses

Importance of monsoon rainfall to people of urban areas

- Cooler – better working and living conditions due to pleasant climate
- Fresher – less air pollution, cleaner air
- Water supply for drinking, factories, market and gardens

Q: Explain why the lack of monsoon rainfall in southern Punjab and Sindh causes problems for farmers.

- Poor crop growth
- Low profit/income
- Little or no other source of rain e.g. no western depressions, relief rainfall, etc.
- High evaporation/evapotranspiration
 - Due to high temperatures
- Need for irrigation which is expensive
- Poor farmers cannot afford tubewells and other irrigation methods
- Can be soil erosion through blowing

Western depressions

- These are the cyclones that originate in the Mediterranean Sea
- They travel across Afghanistan and Iran
- They then reach western areas of Pakistan
- Bring monsoon
- Rise over land
- Clouds causing condensation
- So clouds are formed
- This rainfall occurs during December to March
- Quetta receives most of its rainfall through western depressions (coming from Iran)

Advantages and disadvantages of winter rainfall in northern Pakistan

- Advantages
 - Fills reservoirs and rivers – so more storage
 - Water available for HEP production
 - Water for Barani crops
 - Water for rabi/winter crops/fruit trees
 - Water when everything else is frozen in northern areas
 - Lighter form of rain – can suck in therefore more ground water
 - Snow for tourism due to scenic beauty
- Disadvantages
 - Many fall as snow so of little use
 - This is because rivers/lakes are frozen
 - Damage to environment – landslides, avalanches, etc.
 - Damage to roads – blockage, slippery, etc.
 - Silt collects in reservoirs/dams
 - Difficulty meaning farmers must do transhumance or they are to live a nomadic life

Convectional currents

- At the start and end of summer due to high temperatures
- Moisture evaporates from rivers/lakes/vegetation, etc.
- (moist) air rises
- Air cools as it rises
- Causes condensation of moisture
- ... which causes rainfall often as thunderstorms
- Northern and north – western areas get this rainfall mainly in Peshawar and Rawalpindi
- They are caused from April to June
- They are also caused from September to November

Tropical cyclones

- These may bring a few hours of very heavy rainfall with destructive winds to the coastal areas
- Originate from Arabian Sea quite often but rarely reach coastal areas of Pakistan
- They are caused from April to June
- They are also caused from September to November

Q: Explain how storms such as these may effect industry and communications in urban areas.

- Flooding/heavy rain
- Strong winds
- Lightning strikes
- Damage or closure of buildings, roads, bridges and airports
- Lack of deliveries
- Loss of production/work stops
- Labor cannot get to work
- Lack of experts/investors linked to airports being closed
- Loss of telecommunication
- Loss of power (electricity)

Relief rainfall

- Relates to height of a land
- It occurs where moist unstable air moves up after striking against a mountain side – so it rises
- It is chilled on reaching a certain height
- This chilling causes heavy condensation and precipitation on the ‘wind ward’ side
- The leeward side (the other side of the mountain) receives sinking warm air and a dry rain shadow area is usually formed
- Areas having high altitude receive this rainfall e.g. northern mountains

Q: Feasibility of improving water supply to farmers in Punjab and Sindh

- Advantages
 - Rainfall in monsoon season can be stored
 - Snow melt from mountains
 - Indus river system brings water from highlands
 - Can make more storage of reservoirs of dams and barrages
 - Can build more canals
 - Can use ground water and therefore more tubewells can be built
- Disadvantages
 - Cost of reservoirs or canals

- Cost of tubewells
- Lack of reservoirs and barrages
- Indus Water Treaty limits supply
- Lower water table restricts ground water
- Water logging and salinity problems
- Cost of power supplies for pumps
- Other constraints e.g. education, wastage and conflict between users, etc.

Effects of climate on highland zones

- In northern areas, temperature falls below freezing point/very cold in winter which:-
 - Stops growth of trees
 - Makes farming impossible
 - Transhumance farming is also practiced
 - Landslides and avalanches
 - People are forced to stay indoors so cottage industry is practiced
- Etc.

Effects of climate on lowland zones (semi – arid) (Punjab, Sindh, etc.)

- Crops can be grown in both summer and winter due to arid/hot summers and cool winters
- Densely populated due to extreme summer and winter temperature
- Monsoon rainfall suitable for Barani crops
- Monsoon rainfall provides enough water to river/canals for irrigation
- Flooding in AFP and OFP which is dangerous

Effects of climate on arid zones

- Very hot in summer and dry (very low precipitation) so not ideal for cultivation
- ... and habitation
- Nomadic life...
- Karez system is practiced due to high evapotranspiration in Kharan desert
- People wear thick clothes to protect themselves from hot winds
- Frequent dust storms make work difficult
- Less drinking water

Hazards

Causes of floods

Natural

- Melting of snow in summer
- Heavy monsoon rainfall

Human

- Cutting of trees on foothills increases surface run – off
- Failure to strengthen or heighten embankments along river sides
- Lack of storage facilities e.g. dams and barrages
- Siltation is caused

Effects of flooding

Positive

- More fertility of land through fresh alluvium
- Floods also recharge ground water supply
- More fish in rivers/lakes

Negative

- Farmers cannot practice agriculture until water drains away
- Loss of lives
- Destruction of crops
- Loss of food supplies
- Mud houses and huts may be severely damaged
- Spread of water – born diseases e.g. cholera
- Roads and bridges wash away
- Loss of livestock
- Expensive to reconstruct the infrastructure e.g. roads, bridges, etc.

Precaution

- Planting trees on foothills to check the flow of running water
- Enlarging river channels so that they can hold more water
- Building embankments on river sides to reduce overflow
- Building reservoirs on rivers to store water

- Preventing building in areas where flooding is common e.g. AFP
- Publicizing flood warnings through media
- Timely evacuation of people from flooded areas

Droughts

Types

- **Permanent:** exists when crop cultivation is not possible e.g. Thal desert
- **Seasonal:** areas with well defined rainy and dry seasons e.g. Potowar Plateau
- **Invisible:** is the result of a water deficiency that reduces crop yield but is not severe enough to destroy them
- **Unpredictable:** is the result of abnormally low rainfall in areas which have humid climates

Effects of drought

- Shortage of water
- Shortage of grazing grounds for livestock
- Crops may fail
- This may lead to food shortages
- More import of food like wheat
- Loss of lives due to starvation and thirst
- Loss of livestock
- Weak animals with low outputs
- Diseases e.g. of skin
- More rural – urban migration
- May cause soil erosion through flooding

Solutions

- More reservoirs to store water
- Desalination of salty water to increase the amount of fresh water for agriculture, etc.
- More plantations to reduce soil erosion
- ... and for more moisture in air for rainfall