

Climate

Climate & Weather:

Weather refers to the atmospheric conditions of a short period often localized.

Climate is a generalization of the day to day weather conditions over a long period usually 30 yrs.

Climatic Zones:

- A. Highland Climate:
- B. Lowland Climate:
- C. Coastal Climate:
- D. Arid Climate:

Zone A covers northern & north-western mountains. Zone B covers the Indus Plain. Zone C covers the Makran Coast. Zone D covers Balochistan. A division of Climatic Zones do not imply exactly the same conditions throughout the zone.

Highland Climate: - Gilgit & Balochistan

- Includes northern & north-western (dry & warm) highlands. Long cold winters, short, mild summers.
- Rainfall is normally associated with altitude.
- Rainfall is highest in the highland zones as compared to Western mountains.
- Precipitation mainly in the form of snow.
- Temperature varies from north-west depending on altitude.

Lowland Climate: - Punjab & Sindh

- Includes the entire Indus Plain except for the coastal areas.
- Arid & extreme climate with hot summers, cool winters & summer monsoon rainfall.
- Rainfall from Western Depressions.
- Thunderstorms are common in the north & north-west of the Indus Plain.
- Lower Indus Plain has less rainfall & spells of high temperature.

Coastal Climate: - Sindh, Indus Delta & Makran Coast

- Maritime influence keeps daily temp. low.
- Climate is almost the same - mild throughout the year.

- Climate is dominated by sea breezes.
- Humidity level is high, exceeding more than 50% from April-Sept.
- May, June, and October are the hottest months.
- Scanty rainfall.
- From Karachi-Rann of Kuch, the coast experiences rain during monsoon.

Arid Climate: - Balochistan & Sindh

- Dry, hot, dusty winds, dryness & scanty rainfall.
- SW Balochistan & SE Desert.

Climatic Elements of Pakistan: Temperature, pressure, rainfall and winds.
Responsible for the seasonal variations.

Temperature: Diversity due to;

- Large spread of latitude from 24°N - 37°N.
- Diversity of relief.

Jacobabad is the 'thermal pole' where the max temp. reaches 53°C in June.

Factors affecting temperature of Pakistan:

Latitudinal Effect: Areas near the equator are hotter than areas away. (Tropic of Cancer 23.5°N)

Continental Effect: Climate of areas unaffected by maritime influence. Coastal winds have a moderating effect on temperature. Extreme temp. are recorded in the interior of large landmasses away from moderating influence of sea.

Altitude & Temperature: Higher area altitude areas are cooler. Air is densest at sea level because it absorbs most water vapor, dust particles & solar radiation. Air is least dense at high altitude exerting a low pressure. Thin air & greater cloud cover so low temperature.

Cloud Cover & Temperature: In the daytime it reduces the amount of incoming radiation by reflecting it back resulting in a drop. At night clouds cover traps the outgoing heat. Temperature doesn't drop as low as temperature on a clear night. Less sunlight so low temp. during the day. Heat trapped at night hence warmth.

Latitude & Angle of the Sun: Earth's angle at rotation which sun reflects will be hotter while the rest will be cooler.

Sources of Rain in Pakistan:

Monsoon winds (July-Sept):

- In winters, sea heats faster than land. Moist/dry seasonal winds.
- SW monsoons are giant sea breezes bringing heavy rainfall.
- Hot air rises overland creating a low pressure attracting cool moist air from the sea. Rain-bearing winds are pushed farther inland & are cooled causing rainfall.
- The route begins with the monsoon winds blowing from the Bay of Bengal. After crossing Bangladesh & North-India, the end of the wind enters Northern Pakistan.
- Monsoon winds are seasonally reversed & driven by temp. diff. b/w land & sea. They blow towards the heart of the continent (land areas) in summer. They blow towards the sea in winter.

The Western Depression (Dec-March):

- Western depressions are cyclones which originate in the Mediterranean Sea, travel across Afghanistan & Iran then reach the western areas of Pakistan. When it reaches SW it has lost all its moisture.

Convective currents causing Thunderstorms (April-June) (Oct-Nov):

- Northern & North-Western regions. Due to temperature inversion layer.
- Hot air rises containing high moisture. When it reaches the high layers of the atmosphere, it gets attracted to the cloud which cool the moisture & condensation takes place causing rainfall along with dust.

Relief Rainfall:

- It is related to the height of land occurring where moist unstable air moves up a mountain & it's chilled. When this hot air reaches the temp. inversion layer of the atmosphere heavy condensation takes place on the windward side.
- The lee slopes tend to receive warming air & a dry 'rain shadow' area may lie leeward of the barrier. Murree & Kabul receive rain throughout the year.

Tropical Cyclones (May, June & July):

- Tropical Cyclones may bring heavy rainfall as an aftershock.

- Originates from the sea reaching the coast.

Pressure & Winds:

Hot air rises & forms a low-pressure zone. The air pressure over the oceans & seas is higher than overland during summer leading to the movement of monsoon winds from sea-land which are moisture-laden.

Climatic Zones	Sources
1. Highland zone	Relief rainfall, storms, monsoon rain & western depressions.
2. Lowland zone	Convictional rain & western depressions in North Punjab. Monsoon rainfall.
3. Coastal zone	Monsoon rainfall (Sindh), western depressions (Makran Coast) & tropical cyclones.
4. Arid zone	Little rainfall from Monsoon winds & western depressions.

Effectiveness of Winter Precipitation of Pakistan:

Advantages	Disadvantages
Rain-absorbed by the soil increases moisture preventing soil erosion.	Crop planning becomes difficult.
Provides water to rivers & reservoirs used for irrigation.	If low rainfall, crop cultivation is difficult on Barani farms.
Supplies water for HEP generation.	Damages the environment; landslides.
Barani crops in Northern Pakistan depend on winter rainfall.	Transport linkages are blocked due to snow.
Provides water for Rabi crops, wheat, barley, pulses etc.	Covers grazing lands forcing farmers to practice transhumance.
Snowfall feeds the Indus System.	Lowers temp. making cultivation tough.
Snowfall attracts tourists.	Health problems such as asthma etc.

Effectiveness of Rainfall:

Rainfall is variable in amount, timings & distribution which is why it has a limited effectiveness to agriculture. High temp. leads to evapotranspiration. Heavy showers of rain isn't useful as the soil doesn't absorb the rainwater and floods. Extra waters can be stored in dams, however crop planning becomes difficult. Irrigation mostly depends on 'Barani land' areas dependent on agriculture. Winter rain is more effective, it comes in light showers yet not sufficient nor dependable.

Effects of Climate on the Life & Economic Activities of People in Different regions:

Highland Zone:

- Northern, North-Western & Western Mountains.
- People get involved in cottage industries and transhumance.
- Nomadic herdsman keeping goats & sheep.
- Lack of water supply discourages human settlements.
- Apples, mangoes, apricots, & grapes are cultivated in valleys.

Arid Zone:

- Balochistan & Desert areas.
- Deficient moisture & extreme temp. prevents agriculture.
- Scanty rainfall & evapotranspiration.
- Karez (small water storage schemes) are practiced.
- Avg. Highest temperature rises to 38°C. Cultivation is difficult.
- Construction of perennial canals.
- Locals wear thick & rough cloth for protection from hot temperature.

Lowland Zone:

- Punjab.
- Densely populated.
- Agricultural region with irregular rainfall yet a good canal irrigation system.
- Millet, cotton & sugarcane are cultivated here.
- Alluvial plains keep temperature moderate.

Coastal Zone:

- Sindh & Makran Coast in Balochistan.
- Karachi, Thatta & Badin are imp. centres. Gwadar, Osmana & Pasni located on the Makran Coast are important points for trade.
- Makran Coast is moderate dry & hot.
- Farming is possible almost throughout the year depending on water supply.
- Seaports are open throughout to carry out international trade.
- Business & economic activities never stop.

River Floods: Provides attraction for human settlement & economic development. It's a vital resource for every aspect of life. Excessive may cause floods. The Indus & its tributaries swell & flood almost every year causing serious damage.

What can be done to reduce the risk of floods?

- Planting trees on the foothills to check the flow of running water.
- Enlarging the river channel so that it can hold more water.
- Building embankments on either side of the channel to prevent the spread of floodwater.
- Building extra channels to take floodwater away from towns.
- Building reservoirs on the river to store water & control peak discharge.
- Preventing buildings in areas where flooding is most likely.
- Publicizing flood warnings through radio and social media.
- Evacuate flooded areas & providing necessary facilities for rehabilitation.

Benefits of Floods:

- Floods return nutrients to land.
- Floods distribute rich sediments, refresh streams & spread a layer of alluvium making the land more fertile.
- Natural overflow can prevent serious floods.
- High level of fish production.
- Floods also recharge ground water supplies.

Storms:

- Thunderstorms/ convectional current are common in North & NW Mountains.
- The atmospheric pressure falls & convectional currents cause sporadic & localized rainfall. They may destroy crops.
- Dust storms & strong winds are common in Balochistan due to low pressure.
- Tropical cyclones from the Arabian Sea affect coastal areas of Sindh & Balochistan.

Drought in Pakistan: Lack of rain results in severe water shortages destroying crops. Drought may bring famine, diseases & death on a massive scale.

Types of Drought:

- **Permanent Drought:** when crop cultivation isn't possible without irrigation.

- **Seasonal Drought**: occurs in areas with well-defined rainy & dry seasons.
- **Invisible Drought**: a result of a water deficiency reducing crop yields, but not severe enough to destroy them.
- **Unpredictable Drought**: result of low rain & occurs in areas with humid climates.

Effects of Drought on the Physical environment:

Desertification: process of turning land into a desert. Exposed soil leading to soil erosion, dust storms, extension of desert areas, rise in temperature, loss of vegetation & extinction of species.

Drying up of Rivers, Lakes & Streams: harm to fisheries & other aquatic life, growth of algae in shallow water bodies & unsafe drinking water.

Drop in Water Table: less water available to plants & humans from ground water resources.

Effects of Drought on the Human environment:

Population: Widespread famine leading to starvation. Malnutrition, health problems, starvation & loss of lives.

Migration from drought affected areas. Break-up of rural social set-up & nomadic lifestyle.

Economy: Crop failure, death of livestock, shortages of raw material for industries, reduced exports, increased imports and devastation of the economy.

Drought Management:

Water Storage Schemes: Water can be stored in reservoirs of dams, tanks & canals to help the affected areas by drought & limit the losses.

The Uses of New Technology:

- a) Uses of sea water through a desalination process.
- b) Converting waste water into clean water through filters & chemical treatments.
- c) Use of varieties of seeds for crop cultivation which are drought-resistant & consume less water.

Lining of Canals: to avoid wastages & uneconomical use of existing water. Canal water is wasted due to seepage from unlined canals causing waterlogging & salinity. These areas have stagnant water & salt patches not used in cultivation.

Planning & Management of Water Resources: The government should ensure that high priority is given to allocation of water for basic needs of people & economy.

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